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SUPREME COURT OF THE STATE OF NEW YORK
COUNTY OF NEW YORK

INDEX NO. 110951/96
Judge Charles E. Ramos

MARY ANN HOSKINS, Executrix of the Estate of Edwin Paul Hoskins, WALTINA BROWN and DANTE AUBAIN, individually and on behalf of others similarly situated,

Plaintiffs,

vs.

R.J. REYNOLDS TOBACCO COMPANY, RJR NABISCO, INC., COUNCIL FOR TOBACCO RESEARCH-USA, INC., (Successor to Tobacco Industry Research Committee), AND TOBACCO INSTITUTE, INC.,

Defendants.

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Deposition
of
ALAN NORMAN

TRANSCRIPT of testimony as take by and before JANE F. ALLEN, a Notary Public of the State of North Carolina, at the offices of Womble, Carlyle, Sandridge and Rice, 200 West Second Street, Winston-Salem, North Carolina, on Tuesday, November 18, 1997, commencing at 9:30 a.m.

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- A P P E A R A N C E S -

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ALAN NORMAN,

having first been duly sworn, was examined and did testify as follows:

DIRECT EXAMINATION

BY MR. MAISTROS:

Q. Could you please state and spell your full name for me.

A. My name is Alan Norman, A-l-a-n N-o-r-m-a-n.

Q. Do you have a middle name or initial?

A. Middle initial B. That's for Benson, B-e-n-s-o-n.

Q. Mr. Norman, I'm going to be asking you a series of questions today. If you don't understand my questions, stop me, tell me if you want to take a break. If you want to confer with your counsel, stop me and tell me, okay?

A. All right.

Q. I represent the plaintiffs in this action. Have you ever read the complaint in this action?

A. I have not had a chance to read the complaint.

Q. Have you brought any documents today with you to the deposition, other than the

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tentative paper that you are going to submit to CORESTA?

A. No, I haven't.

MR. BELASIC: For the record, that paper, Cigarette Materials and Design, by Alan Norman, is going to be published as a manograph, and for that reason, we would like to designate it as confidential under the protective order.

BY MR. MAISTROS:

Q. What is the title of that manograph?

A. Cigarette Materials and Design.

Q. Are you the sole author of that manograph?

A. Yes, I am.

Q. Or article.

You have prepared a report in this action, correct?

A. Yes, I have.

Q. What materials did you rely upon in preparing that report?

A. Primarily my experience working at R.J. Reynolds.

Q. Did you review any specific documents or memorandum before preparing that report?

A. No, I did not.

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Q. Did you read any depositions of any other witnesses before preparing that report?
A. I don't recall reading any depositions before that report, no.
Q. Have you read any depositions of any witnesses in any cigarette litigation?
A. Yes, I have.
Q. Which depositions?
A. I think one by Dr. Dave Townsend. I don't remember which case it was in.
Q. When did you read that deposition?
A. It has probably been a month or more ago.
Q. Do you know how long that deposition was, how many volumes?
A. I don't recall.
Q. Why did you read that deposition?
A. Well, I'm being asked to be an expert witness by my company in some of these litigation actions, and I wanted to get a feel for what the deposition process is, so I read the deposition.
Q. Do you remember any of the questions that were asked at the deposition?
A. I can't recall any offhand, no.
Q. Who provided you the deposition?
A. Legal counsel here in Winston-Salem.

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Q. Who was that?
A. Mark Holton.
Q. Were there any documents provided with the deposition?
A. I don't recall any, no.
Q. Did you meet with counsel before preparing your report in this matter?
A. Yes, I did.
Q. On how many occasions?
A. I just would be guessing, but I would say in the neighborhood of three or four times.
Q. How long on each of those occasions did you meet?
A. Again, I would be guessing. Probably no more than an hour an each occasion.
Q. Is this the first time that you've ever prepared an expert report?
A. Yes, it is.
Q. Have you prepared any expert reports since you prepared the expert report in this case?
A. No. I don't think so.
Q. So the New York case is the only case that you've ever prepared an expert report in?
A. No. I have -- it is essentially the same

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expert report, but I believe it has been filed in a number of cases.

Q. Which cases?

A. I don't know. There is maybe 20 or so. I don't recall all the names of all of them.

MR. MAISTROS: Would you give me a list of that?

MR. BELASIC: I think we can do that. I don't know offhand.

BY MR. MAISTROS:

Q. Have you been deposed in any of these other cases?

A. I have not, no.

Q. Have you ever been deposed before in any case?

A. No, I have not.

Q. Has your expert report that you've prepared in these other cases, is it identical to the report that you prepared in this case?

A. I believe that we may have filed expert reports for some cases earlier this year that were not quite the same as the one filed in the Hoskins case.

Q. How did they differ?

A. I think we added some words having to do

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with PH of smoke and ammonia and nicotine.

Q. Are you familiar with Reynolds' use of ammonia or diammonium phosphate?

A. Yes, I am.

Q. Is there a more proper phrase to use for ammonia or diammonium phosphate, if I want to ask you questions about both of those or do I have to distinguish them each time?

A. Well, they are two different entities. Ammonia is a chemical compound, diammonium phosphate is a different chemical compound.

Q. Is there any compound that is similar to either of those that is used by Reynolds?

A. I don't understand similar. Similar in what way?

Q. Similar in structure to ammonia or diammonium phosphate?

A. I can't think of any others, no.

Q. Are there any compounds that Reynolds uses that have the same purpose or similar purpose as do ammonia or diammonium phosphate?

A. Not that I'm aware of, no.

Q. What is your date of birth?

A. July the 15, 1953.

Q. [redacted]

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REDACTED

Q. How long have you resided there?
A. For approximately 17 years.
Q. Any plans to move in the near future?
A. No.
Q. Are you married?
A. Yes, I am.
Q. How long have you been married?
A. Twenty-three years.
Q. Your wife's name?
A. Wanda.
Q. Does she work for Reynolds?
A. No.
Q. Has she ever worked for a tobacco company?
A. No.
Q. Do you have any children?
A. No.
Q. Have you been in the military?
A. No, I have not.
Q. Do you smoke?
A. Yes, I do.
Q. How long have you smoked?
A. I think I started smoking when I was 16 or

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17.

Q. Was there ever a period of time when you did not smoke?

A. No.

Q. What do you smoke currently?

A. Right now I smoke Eclipse.

Q. How long have you smoked Eclipse?

A. I just took it up about two weeks ago.

Q. What did you smoke?

A. Camel Lights.

Q. Why did you switch?

A. Eclipse is a relatively new product that we make, and I haven't tried those since they came out of the lab and went into test market. I tried them and liked them and decided to switch.

Q. Where did you attend high school?

A. I started high school in Atlanta, Georgia. Then my family moved to Macon, Georgia when I was in the eighth grade, so I went to Mark Smith High School in Macon, Georgia, most of the time.

Q. What year did you graduate?

A. 1971.

Q. Did you go to college?

A. I went to Georgia State University, from '71 through 1975, when I obtained my Bachelors of

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science degree. I continued my education there through Master of science degree in 1976, both at Georgia State University.

Q. You received your Masters in '76?

A. Yes.

Q. Have you had any subsequent formal education?

A. At a university or college, no.

Q. What was your Masters in?

A. Chemistry.

Q. Do you hold any licenses, other than a drivers license?

A. No.

Q. Have you taught?

A. I've taught a course in cigarette design at R.J. Reynolds on several occasions.

Q. Did you use a course book for that course?

A. No. We don't have a course book.

Q. What kind of materials did you use to teach your cigarette design course?

A. We have a number of overhead transparencies that we use for that, and collection of articles that are from literature.

Q. Have you ever put those together in a

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compilation such as a textbook or course book?
A. Well, we have a handout that we give to participants that contains most of those materials.
Q. Do you teach this course with anyone else?
A. Yes, I have.
Q. Who?
A. Dr. Dave Townsend.
Q. How often do you teach this course?
A. Well, we haven't done it in awhile. It's probably been five or six years, and to my recollection, we probably taught it together on at least four or five occasions over the years.
Q. Who attends this course?
A. It can vary. The last time we gave it, I believe there was some R and D employees there as well as individuals from marketing, quality assurance.
Q. Anyone from management?
A. Well, we don't make a distinction. We don't have a management department per se, so some of the R and D employees or Q And A employees or marketing employees could have been managers as well as professional people.

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Q. There's managers and professional people at Reynolds?
A. Yes.
Q. What are you?
A. I'm a professional person.
Q. So the managers are unprofessional?
A. I didn't mean to imply that managers are unprofessional.
Q. Are you talking in a technical sense versus management?
A. Yes. I meant technical sense.
Q. When did you begin at Reynolds?
A. In October of 1976.
Q. Other than depositions, have you testified in any court cases for Reynolds?
A. I was at two small claims matters on behalf of Reynolds.
Q. Where were those?
A. One was in Sacramento, California. The other was in Seattle, Washington.
Q. Was Dr. Robinson with you in Sacramento?
A. Dr. John Robinson was with me in Sacramento, yes.
Q. How about in Seattle?

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A. Yes. He was there, too.

Q. What did you testify about in those two cases?

A. I don't know whether I would characterize it as testifying. Both Dr. Robinson and I were under oath and essentially what my job was, was to present our points of arguments, and in neither case did we get into any merits of the case that required my testimony. Dr. Robinson did speak in the Seattle case, though.

Q. Were you under oath speaking in both cases?

A. Yes.

Q. What did you speak about?

A. Primarily in both cases we felt that the statute of limitations applied, and I talked about that.

Q. What did you talk about with respect to the statute of limitations?

A. Well, again, in both of those cases the plaintiffs had brought suit after a lengthy time period, and I just spoke about the fact that we thought the statute of limitations applied in each case.

Q. Do you have a legal background?

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A. I do not.

Q. Well, how did you, as a chemist, talk about the statute of limitations, from a legal sense or when Reynolds knew certain things?

A. When I said talk about it, I said essentially what I just said to you, we feel that the statute of limitation applies in this case.

Q. That's the extent of your testimony, you didn't talk about chemistry or the design of cigarettes or anything else?

A. No. It was not necessary.

Q. Have you provided any consultation services to Reynolds, although you have not actually testified or been deposed in other cases?

A. I don't believe so.

Q. Have you provided consultation to Womble, Carlyle or any other attorneys on behalf of Reynolds?

A. I'm not sure what you mean by consultation.

Q. Well, you've prepared reports in cases, correct?

A. I've prepared the witness reports that we just talked about.

Q. Have you done anything besides that?

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A. No. I don't believe so.

Q. Have you advised Womble, Carlyle or any other attorneys on how to question certain witnesses?

A. Yes. I helped prepare a list of witness questions for a witness.

Q. Which witness?

A. I believe that was a Dr. Finegold, whom I do not know.

Q. Do you know what case that was?

A. I don't recall right now, no.

Q. Other than the cigarette design course you taught five or six years ago, are there any other courses that you've taught?

A. No.

Q. Have you provided any sworn statements to Reynolds or on Reynolds' behalf in any cigarette litigation, other than the reports?

A. Well, we just talked about the too small claims court cases that I was involved in.

Q. Have you provided any material for Reynolds for submission to any governmental agency, such as the FDA or FTC?

A. I have assisted writing some responses to both the FTC and the FDA.

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Q. What type of responses?
A. A couple years ago the FDA wrote a -- I don't really know what the correct name for the document was, but it was a lengthy article on whether cigarettes should be regulated by FDA or not, and again, I don't recall the title to that. I helped draft part of a response to that document.
The FTC, on a couple of occasions -- over the years the FTC has questioned or put out for public comment, whether or not the FTC's test method for cigarettes should be changed, and I helped write some responses to that on at least one occasion, maybe twice.
Q. Do you recall what portion of the response to the FDA you drafted?
A. I don't recall explicitly. I remember in the original FDA document there were a couple pages having to do with tar and nicotine yields, and in particular, elution of nicotine from filters, and I drafted a response to that specific two or three pages.
Q. What is the process of elution of nicotine from filters?
A. Well, I think it is more properly termed, I

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may have said process, but a phenomena.

Q. Well, you did, I didn't. What's the phenomena?

A. This is where when you smoke a cigarette, smoke is deposited on the filter. The filter retains some of the particulate matter in the smoke, and what we think is that some of the nicotine comes off the filter or some of the nicotine is deposited originally on the filter comes off the filter with subsequent puffs, sweeping through the filter, and that's the phenomena we call elution and what it refers to is some of the nicotine comes off the filter while you are smoking the cigarette.

Q. What specifically did you write about in response to the FDA?

A. Well, the FDA's original document cast this phenomena called elution, as something that we can control through the design of the cigarette, which is not true.

Q. Does Reynolds quarrel with the proposition that nicotine elution occurs?

A. No, we don't.

Q. When did Reynolds first learn that nicotine elution occurred?

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A. My first recollection is a paper written by a scientist working at Tennessee Eastman Company. That article was published in the early 70's.

Q. They are a filter manufacturer?

A. They are a manufacturer of cellulose acetate tow.

Q. Have filters been designed to reduce nicotine elution?

A. No. I don't know a way to design a filter that would reduce nicotine elution.

Q. Why is nicotine elution, or why did the FDA consider nicotine elution significant?

A. I can't say. I don't know.

Q. Does nicotine elution effect the FDA tar and nicotine test results?

A. Well, the FDA doesn't have a test for cigarettes.

Q. They did, did they not -- I'm sorry, the FTC. Does nicotine elution effect the FTC test results?

A. It might have a very slight effect on the nicotine yield in the FTC test.

Q. In which way?

A. It would make the -- to the extent that elution occurs, you would have that slight

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increase in the nicotine yield relative to the case where if elution didn't occur.

Q. Has Reynolds done tests to determine if the amount of nicotine elution is the same for both the FTC test method and normal smokers?

A. Not to my knowledge, no.

Q. Do you recall if you wrote about any other topics in response to the FDA's finding with respect to nicotine?

A. I think part of that response may have included some discussion of effects of air dilution, filter dilution on smoke yields.

Q. Did you discuss ventilation?

A. Yes. When I say air dilution, I really mean ventilation. I use the two terms interchangeably, but ventilation, air dilution, same thing.

Q. Do you use them interchangeably for both the paper and the filter?

A. Yes. I tend to. It is really more proper to say ventilation.

Q. For both filter or paper?

A. Both for filter and paper.

Q. Any other topics?

A. That's all I recall.

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Q. What was the outcome of the FDA proceedings?

A. I don't know.

Q. You did not testify before the FDA or a committee?

A. No.

Q. Now the FTC comments that you participated in, how many times did you do that?

A. Well, as I said before, once in the early 80's and then there is a discussion going on right now about changing the FTC method, and I have helped with some responses to public comment, calls on that as well.

Q. What position did Reynolds take in the early 80's on the FTC testing method?

A. I'm not sure I understand your question.

Q. Well, were you asked to comment upon what the ethicacy of the test or could it be improved in the early 80's, tell me what you were asked to comment upon.

A. Well, it's been a long time ago and I don't remember all the in's and out's on that.

Q. Well, was the FTC thinking about changing the testing method?

A. As I recall, the FTC called for public

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comments on whether or not the method should be changed.

Q. And do you recall what position Reynolds took?

A. Well, we took the position that the test method was adequate as regarding meeting the original objectives that the FTC set for the tests.

Q. Are you familiar with the FTC test method?

A. Yes, I am.

Q. Could you generally describe that process for me?

A. The FTC test method, is a method for collecting and analyzing the tar and nicotine yields from cigarettes. Now they also include the carbon monoxide yield from the cigarettes and what the test entails or prescribes, is exactly how the cigarettes are smoked, the size of puff taken, the frequency or time interval between puffs, the length of the duration of the puff, the butt lengths and that's the amount of cigarette remaining after smoking is stopped. It also prescribes a particulate method of collecting the smoke, and that's called a

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Cambridge filter method.

It prescribes the environment in which the cigarettes are smoked, and that includes the temperature, humidity conditions. There is a preconditioning step where the cigarettes are held for at least 24 hours in this particular temperature and humidity environment before they are smoked.

Q. Is there a certain amount of puffs that are taken?

A. No. The puff, number of puffs is variable, and it is going to depend on a number of factors about how the cigarette is constructed and the butt length that is used to smoke the cigarette. That's what the FTC test prescribes, is butt length.

Q. How frequent are the puffs taken?

A. Once every minute.

Q. And for how long are the puffs?

A. The puff duration is two seconds.

Q. In your typical 80 millimeter cigarette, how many puffs does that yield?

A. Well, cigarettes are typically longer than 80 millimeters.

Q. What is typical?

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A. 85 millimeter soft pack is a fairly typical cigarette.

Q. What is the range of puffs, FTC testing method?

A. Well, it could vary considerably, but I would say between seven and nine puffs would be a reasonable range.

Q. Is there a typical volume of smoke that is inhaled pursuant to the FTC testing method?

A. I don't understand your question.

Q. Okay. There is seven to nine puffs every two seconds each every minute. What is the average per volume puff?

MR. BELASIC: I object to the form. I think that misstates what he just said about the puffs per minute. You can answer.

THE WITNESS: Well, the FTC method has a set puff volume which is 35 milliliters.

BY MR. MASITROS:

Q. So it's one puff lasting two seconds every minute of approximately 35 milliliters?

A. That's correct.

Q. Now, is every cigarette tested to a certain butt length?

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A. No. The butt length is defined by the FTC method, and what the butt length is, is three millimeters beyond the over wrap where the tipping paper joins the tobacco rod for filtered cigarettes, and I think it is 23 milliliters for unfiltered cigarettes.

Q. Has Reynolds conducted tests to determine if the average smoker takes in 35 milliliters of smoke per puff?

A. Well, we have a hard time making any kind of measurement of what a smoker takes in. We have made measurements of the size of puff volumes that people take, the frequency of puffing and the duration of puffs that people take.

Q. What is the size? You mean the volume?

A. Volume, right.

Q. How does the actual smoking experience compare to the FTC testing method in terms of the size of the volume of the puff?

A. Well, when we make measurements of this puffing behavior that I just described, and that is the volume of a puff and the frequency of the puffing and puffing duration, we have to make

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laboratory measurements, and that means asking people to come into some laboratory facility and they smoke a cigarette that has a small sensor attached to it, and when we do that, I have a question as to how realistic that really is.

Since we've asked people to come into a laboratory they are not smoking under the normal conditions they would be smoking under. With that caveat said, though, we see puff volumes that are around 45 milliliters. Puffing frequencies can vary quite a bit, depending on what task you give people while they are smoking the cigarette, but I would say a typical laboratory experiment would show two puffs a minute rather than one puff a minute, which is in the FTC test, and puff durations are close to the two second duration that the FTC method prescribes.

Q. So the puff volume is about ten milliliters greater than the FTC testing method on average?

A. In laboratory testing when people are smoking cigarettes, we see around a 45 cc or 45 milliliter volume, yes.

Q. And you get two puffs a minute

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instead of one puff a minute?

A. And again, this laboratory condition that I'm describing, we can see two puffs a minute. That's a measurement that is quite dependent on what people are doing while they are smoking the cigarette. Other kinds of laboratory tests -- well, I shouldn't say laboratory tests. I'm aware of people who have reported puffing frequencies that are much longer than that, closer to once a minute or even longer, where they measured the puffing frequency by observing people in real more like natural conditions like at a party or a bar, whatever, and I think that when we make these laboratory measurements, we're seeing some artificiality in that puff frequency number.

Q. Has Reynolds reported their laboratory tests to the FTC?

A. I believe we have, yes.

Q. Does the FTC testing method calculate air dilution?

A. No, it does not.

Q. Does it calculate draw?

A. No, it does not.

Q. Does it calculate pressure drop?

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A. No, it does not.

Q. Does it calculate the amount or the existence of ventilation holes in the filter wrap?

A. No.

Q. Does it calculate the additives that are in cigarettes?

A. No.

Q. Does it calculate the top dressings?

A. No.

Q. Does it calculate casings?

A. No.

Q. Does it calculate the chemical makeup of the cigarette smoke?

A. The test measures tar, nicotine and CO, the carbon monoxide. In order to get tar, the way they calculate that is they take what is called wet total particulate matter, which is essentially the weight gain on the Cambridge filter that is used to collect the smoke, analyze the total particulate matter for water content and nicotine content, subtract the water and the nicotine from the wet TPM, and that's the tar number, so what is accounted for in the FTC test are those things that you just mentioned. It is

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a test that measures the tar yield, the nicotine and the carbon monoxide and the only two smoke constituents that are explicit are the nicotine and CO and water.

Q. Now, do you know what free nicotine is?

A. I believe that term refers to nicotine in its base norm.

Q. Well, what form is nicotine in cigarette smoke?

A. I don't know of a test that anybody has ever done to show what the form of nicotine is in the smoke.

Q. Well, is it in the gas phase, a vapor phase, particulate phase?

A. It is in the particulate part.

Q. That's all?

A. So far as I know, the vast majority of it is in the particulate part of smoke.

Q. Does the Cambridge filter measure the gas phase?

A. No, it does not.

Q. Does the FTC testing method measure the gas phase of nicotine, the content in the gas phase?

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A. Well, no. And, we don't think there is any nicotine in the gas phase.

Q. Who is we?

A. Well, when I say we, scientists at Reynolds and scientists outside of Reynolds. Part of what scientists have done to make sure that the FTC test is accurate in its reporting of nicotine and tar for the particulate method of smoke in the cigarettes is looked to see if any nicotine is coming out of the Cambridge pad. In other words, on the backside of the filter, and there isn't any.

Q. Are you equating the gas phase with the vapor phase?

A. Yes. In this discussion, because you are talking about what the Cambridge filter traps versus what it doesn't trap. The Cambridge filter traps particulate matter but not gas phase.

Q. Does Dr. Townsend share your view that there is no nicotine in the vapor or gas phase of the smoke?

A. I don't recall discussing it with him.

Q. In your cigarette design course, did you teach that the Cambridge filter, or did you

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talk about the Cambridge filter in your design course?

A. In our course we do talk about the FTC smoking method and the Cambridge filter pretty much in the manner that I've described here today.

Q. Do you talk in your course about gas phase versus particulate phase of nicotine?

A. No.

Q. In your course do you talk about air dilution?

A. Yes, we do.

Q. What are the primary methods utilized to accomplish air dilution?

A. Well, first of all, when we say air dilution, and I said earlier today that ventilation is a better term and I'm going to try to stick to ventilation, but ventilation is any air that enters the cigarette other than through the fire cone end, and since that's the case, you can have ventilation through the cigarette paper. You can have ventilation through the filter.

Q. Ventilation through the paper, is that a product of porosity of the paper or ventilation holes or both?

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A. You can get ventilation through the cigarette paper via inherent pores that are formed in the paper during its manufacture. You can also perforate paper to afford a higher porosity and thereby provide ventilation through the paper.

Q. Does Reynolds use perforated paper?

A. I don't think we have any cigarettes with perforated paper in the domestic market.

Q. Has Reynolds used perforated paper?

A. We may have, but I can't recall any specific case of that.

Q. What is the end result difference between perforated paper versus perforated filter on the total dilution or ventilation?

A. Well, total ventilation is the sum of ventilation through the cigarette paper and through the filter, and if you increase the ventilation through the paper, you increase the total ventilation of the cigarette.

Q. Now the inherent pores in the paper, does Reynolds utilize paper with differing inherent pores?

A. Yes, we do.

Q. What are those differences called?

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Is there a term used to characterize the difference in permeability of the paper or porosity?

A. Excuse me. Yes. We use what is called the CORESTA test. For more porosity there is CORESTA standard test we're doing now.

Q. The CORESTA test measure, is that something that you have to do every time you use paper or is it printed on the paper what the range is for permeability or porosity?

A. We have a routine QA procedure for measuring incoming papers to make sure it is what we specified.

Q. But can you call up a paper and say send me over X type of paper with blank CORESTA?

A. Yes.

Q. What is the range, CORESTA range?

A. I'm not sure I understand your question.

Q. Okay. Is it permeability or porosity which is the more accurate term?

A. Well, I think permeability is the more accurate term. Sometimes I'll use porosity, but I really would prefer using permeability.

Q. So like you can get fine, course, very course, for sand paper there are different

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grades, CORESTA grades of paper for permeability?
A. Yes.
Q. What is that range?
A. Well, I think commercially used paper is probably from ten CORESTA units to maybe a hundred CORESTA units.
Q. Which is more permeable, the ten or the hundred?
A. The 100 is the more permeable.
Q. So more air comes through the hundred than the ten?
A. That's correct.
Q. Everything else being equal, how much can you change the nicotine and/or tar yields based upon a ten to hundred range of permeable paper?
A. I don't have that number on top of my head, and that would require quite a bit of calculating.
Q. Does the permeability of the paper effect the tar yields?
A. Yes. The permeability of the paper can effect the tar yield.
Q. Does the permeability of the paper effect the nicotine yields?

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A. Yes. Paper permeability will effect nicotine yields.

Q. Everything else being equal, as the permeability of the paper goes up, will the tar and nicotine yields go down?

A. Yes. That's correct.

Q. They don't go up and down in a one for one relationship, though, do they?

A. Roughly one to one relationship, yes.

Q. Cannot the permeability of the paper effect the tar yields differently than it does the nicotine yields?

A. Slightly differently.

Q. Depending then upon the permeability of the paper, you can reduce the tar yields without reducing the nicotine yields in the exact same amount, correct?

MR. BELASIC: Object to the form.

BY MR. MAISTROS:

Q. You can answer.

A. If I increase the permeability of the cigarette paper, the tar yield will go down and the nicotine yield will go down in rough proportion to the degree of permeability change that I've made. It is the slope of line, if you

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will, or the rate of production of tar is not the same as the rate of reduction of nicotine. They differ very slightly.

Q. The tar is reduced more than the nicotine, is it not, everything else being equal?

A. Yes, it is.

Q. Now you can reduce the tar also through the filter, right?

A. That's correct.

Q. The filter reduces the tar levels in a manner differently than it reduces nicotine levels?

A. Well, the filter efficiency for tar is about one or two percent higher than the filter efficiency for nicotine, if I am recalling correctly.

Q. So it reduces tar about one to two percent greater than it reduces nicotine?

A. That's about right, yes.

Q. Is there also a phenomena known as tar elution?

A. No. Tar does not elute from the filter.

Q. Does that one to two percent difference that you mentioned take into consideration elution of nicotine?

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A. Well, if you measure the amount of nicotine coming out of the filter via elution and add that back onto the filter efficiency calculation, you get the same filter efficiency for tar and nicotine, so it is possible that this elution phenomena is the reason that nicotine filter efficiency is a bit less than that for tar.

Q. Is it the filter wrap or club wrap that are ventilated?

A. There is two ways to make a ventilated filter; one is, you use a porous plug wrap than the paper that wraps around the filter fibers, and you have a tipping paper that joins the filter to the tobacco rod and that can be perforated so there is a ventilation air route through the holes in the tipping paper in the porous plug wrap.

The other way to make ventilated filters is, you can use a non porous plug wrap and an unperforated tipping, and once the cigarette is assembled, you can use a lazar to make holes in the tipping and in the plug wrap.

Q. Does Reynolds utilize that latter process?

A. We do. We make both. We make lazar

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perforated filter vent systems as well as pre perforated porous plug wrap system.

Q. How does Reynolds distinguish between which cigarettes utilize which system?

A. I think that most of the cigarettes, they use pre perforated that are of higher tar yields. The ones that we use that have lazar perforated are the lower tar cigarettes.

Q. Are they higher tar yields because they use the pre perforated system, or are they higher tar yields because of other factors?

A. In any cigarette design, what we try to do is balance the tar yield for that particular type of cigarette with the different particular nicotines we use to design the product, so when I say higher tar cigarette, it is going to differ from an ultra low tar cigarette in the filter efficiency, the level of air dilution or the degree of air dilution, the cigarette paper and the amount in use of expanded tobacco and other aspects of the composition.

Q. But I'm still -- I'm just probably confused, but why are the higher yield cigarettes, why do they utilize the pre perforated paper and the plug wrap as opposed to

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the lazar?

A. Well, the lazar has some limitations, and the last time I worked with that, it has been awhile, it was not capable of producing lower air dilution levels. It works best at air dilution levels above about 40 percent, and with the pre perforated system, we can make lower air dilution more reliable.

Q. Whether the ventilation or the holes, what is the proper -- what is lazar, pre done, are they ventilation holes?

A. Ventilation holes is fine.

Q. Does the location of ventilation holes effect the ventilation efficiency?

A. Well, the location of the holes is related to the ventilation level in kind of a complicated way, but all things being equal, if you move the holes, you'll change the ventilation level, that's right.

Q. Are the holes, whether done by lazar or pre done, are the holes, do they have varying locations depending upon the type of cigarette?

A. I think for our own line lazar products the location is fixed because of the way the machinery works and for a certain number of

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cigarettes that use what we call micro sized holes, they may have a location that is more -- that is a little bit further away from the mouth than all the lazar ones do, but when we make those variations, it is not because of level of ventilation that we're trying to get, it is more related to the mechanics of how you apply the papers to the cigarettes.

Q. Are there different numbers of holes, or it depends upon the filter or ventilation efficiency you wish to achieve?

A. Yes. The ventilation level depends on a number of factors, but all things being equal about the cigarette design is, if you increase the number of holes at a constant size of the holes, you'll increase the ventilation level.

Q. If you took two cigarettes that had the same tobacco blends and the same tobacco paper and modified either the location or number of holes, how much could you change the tar and nicotine yields, what kind of range would you effectively work with?

A. If I held everything constant and just changed the location of holes, I couldn't effect the yields very much at all. If I changed the

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number and size of the holes, I can change the yield quite a bit.

Q. We're talking about the same type of filter material or composition or makeup for both of these hypothetical cigarettes, okay. If you change the size and number of holes, how much could you effect the tar and nicotine yields?

A. Well, by changing the size and number of holes, you can essentially go from no air dilution to as close as a hundred percent as is possible, given the physics of the situation, so you have as big a range as you can get for the particular design that you are holding constant.

Q. So you can go from an ultra light to a full flavor --

A. Well --

Q. -- With the same tobacco?

A. The exact level of tar and nicotine yield you are going to get depends on the rest of the design, but what I am saying is, you can change the air dilution level from zero to as high as practical possibly, which is going to have a big effect on the yield. To get specific and talk about which categories you might cross, you would have to know what the rest of the cigarette

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design is.

Q. I'm asking you to assume for purpose of my question, that it is the same tobacco blend in both cigarettes, same tobacco paper and the same filter, other than the size and number of holes. That's the only variable, the size and number of holes. What kind of range can you get from making changes in the size and number of holes in tobacco and nicotine and tar yields?

A. Well, what I was trying to explain to you is, that if you took your cigarette hypothetical and say without any air dilution at all you put a filter on that gave you a low tar yield, then that's the starting point for my range.

Q. Right.

A. If I could up from there to say 80 or 90 percent air dilution, I could conceivably have a cigarette that has one milligram of tar, so that could be a range. I could get a different range, though, if I had chosen a different filter for my starting point.

Q. Right. For my hypothetical I'm just looking to see actually how much you can change the tar and nicotine yields by changing the size and number of these ventilation holes. You said

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you could go from a low tar yield to one milligram. What would your low tar yield in your hypothetical cigarette be in terms of milligrams?

A. Again, if I had chosen a particular filter that without any ventilation holes in it gave me ten milligrams, I could easily go up to 80 or 90 percent ventilation and have a one milligram tar yield.

Q. So there could be a ten fold decrease in the tar, depending upon the number, I'm sorry, the size and number of ventilation holes?

A. Yes, sir.

Q. Would the same follow for nicotine?

A. Yes.

Q. How many different designs of filters does Reynolds utilize?

A. I don't know.

Q. What effects the different designs of filters? Let's start with what are the filters made of?

A. Filters that are made of cellulose acetate tow.

Q. Are all of the Reynolds filters made of cellulose acetate tow?

A. To the best of my knowledge, all the

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filters that we sell in the United States are made of cellulose acetate tow.

Q. Would that include EW?

A. We're not currently selling EW. That was on the test market and it had a part of the filter made from paper that used some charcoal in the paper.

Q. Why was EW taken off the market?

A. It wasn't consumer acceptable and it was in test market only, by the way.

Is this a good time to take a break?

MR. MAISTROS: Any time you want.

(RECESS TAKEN)

BY MR. MAISTROS:

Q. When we broke we were talking about the cellulose acetate tow and EW. Does Reynolds manufacture its own filters?

A. Yes, we do.

Q. And there are different types of filters?

A. When we say different types of filters, the difference in filter design is a question of exactly what we call a tow item that's used in the cellulose acetate filter.

Q. You have the cellulose acetate which

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makes up 100 percent of your filters?
A. No. It is not a hundred percent of the filters, because we put a plasticizer.
Q. I'm not talking about that. 100 percent of your filters contain cellulose acetate?
A. I'm still not making a connection with your question.
MR. BELASIC: You mean all the filters?
BY MR. MAISTROS:
Q. All the filters utilized in markets commercially in the United States, all of the filters contain some portion of cellulose acetate?
A. Yes. That's correct.
Q. And they contain plasticizer?
A. Not plasticizers, a plasticizer.
Q. One type?
A. As far as I know, yes.
Q. There is only one kind of plasticizer used by Reynolds?
A. I believe so.
Q. What is that called?
A. Triacetin.

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Q. How do you spell that?
A. T-r-i-a-c-e-t-i-n.
Q. Do the filters, depending upon the design, contain different amounts of plasticizer?
A. I don't know.
Q. What else are the filters made up of, other than that cellulose acetate and plasticizer?
A. I'm not sure that we put anything else in there.
Q. No flavorant in the filters?
A. We have put flavorant in the filters in the past. I'm not sure if that's our current practice.
Q. What type of flavorants have been put in in the past?
A. I don't know the nature of the flavorants that were used in the past.
Q. Were there materials used in the past to try to selectively reduce certain chemical compounds in the cigarette smoke?
A. No. The materials I was referring to would be some combination of flavorant materials and they would not have any function towards selecting or removing anything.

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Q. Were there any materials ever put into Reynolds filters for the purpose of attempting to selectively reduce certain compounds?

A. Yes.

Q. What materials were added to the filters?

A. We used to manufacture a cigarette with a charcoal filter.

Q. What was that cigarette?

A. Tempo was the name of that cigarette.

Q. Any other additives to the filter itself?

A. Are you referring to the Tempo cigarette?

Q. Any cigarette, any other additives used to selectively reduce certain chemicals or compounds?

A. I'm not aware of any that Reynolds has used other than charcoal.

Q. So there is cellulose acetate and plasticizers currently in the filters, nothing else?

A. Again, we may or may not put a flavorant on the filters. I just don't know if that's our current practice.

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Q. Nothing other than those three items then?

A. Well, it would only be the flavorant material if we still use it. I just don't remember whether we do or not.

Q. Does the amount of cellulose acetate vary per filter?

A. Yes, it can.

Q. Does the thickness of cellulose acetate vary per filter?

A. It can.

Q. Does the compression of cellulose acetate vary per filter?

A. Yes, it can.

Q. Do you know what crimping of cellulose acetate means?

A. Yes. That refers to -- well, the cellulose acetate tow that is used in cigarette filters is what is called a monofiliment, and crimping the tow means, in effect, putting more tow in each filter, and in essence, what you are doing is putting an angle on the fiber so that it has a zig zag shape if you could microscopically view it.

Q. Is there any other modifications that

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are made to the cellulose acetate to effect the filter efficiency or design?

A. The way we make different filter efficiencies is choice of denier per filament which you referred to a moment ago as thickness.

MR. BELASIC: Spell that.

THE WITNESS: D-e-n-i-e-r. Total denier, which refers to the total weight of the bundle of fibers that's going to go into the filter. How much filter material is packed into the filter plug that goes on the cigarette and you refer to that as compression. Those are essentially the ways we can change the efficiency of the resulting filter.

BY MR. MAISTROS:

Q. Do all of those changes effect the nicotine deliveries?

A. To the extent that you change the filter design to have a different filter efficiency, the tar and the nicotine efficiencies will be changed.

Q. Are the tar and nicotine efficiencies changed in an equal manner for each change you make in those variability that you just cited?

A. I know they are more or less equal.

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Q. Does increasing the total denier effect the tar and nicotine in the exact same amount?

A. Probably not.

Q. Are the nicotine yields, more or less everything else being equal than the tar yields, depends upon changes in the total denier?

A. Could you repeat that question, please?

Q. Sure. The total denier effects the tar and nicotine yields in a different manner, does it not, as you change the total denier?

A. If I change the total denier of the filter, all else being equal, the tar and nicotine yields will change in a rough proportion to one another. They won't be exactly the same, though.

Q. As the total denier increases, the tar is reduced, correct?

A. Yes. Everything else being equal, if you increase the total denier, tar yield will decrease.

Q. And nicotine yield will decrease slightly less proportionately than the tar yield, correct?

A. Nicotine yield will decrease, but not at the same rate as the tar yield as you increase

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the total denier, that's correct.

Q. Slightly less?

A. Slightly less.

Q. Now, as you increase the denier per-filament, does the tar yield go down, everything else being equal?

A. Yes. All else being equal, if you increase -- no. Excuse me. Decrease the denier per filament, all else being equal, the tar yield will go down.

Q. As you decrease?

A. As you decrease its denier filament, the tar yield will go down.

Q. What about nicotine yield?

A. The nicotine yield will go down as you decrease denier.

Q. Same proportionate ratio as tar?

A. Roughly proportional to one another.

Q. Won't nicotine yield decrease slightly less than it will the tar yield?

A. The nicotine yield will probably decrease slightly less than with the tar yield.

Q. Now you made a distinction between the total denier and how much you packed into a plug. What is the distinction there?

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A. Well, the total denier refers to the weight of the band of tow filaments, but the bands of tow filaments is not fluffed up and doesn't have enough bulk to make a proper filter, so we do two things; one is what we call the process called opening the tow, and that means essentially fluff it up, and then you can pack more or less of this fluffed up tow into the filter, so there is the difference being you can have total denier variations and you could have packing density is a good term for it. You can increase the packing density of the filter, even at the same total denier.

Q. I see. As you increase the packing density, everything else being equal, the tar yields should go down?

A. Tar yields will go down if you increase the packing density.

Q. And nicotine yields will go down, everything else being equal?

A. Nicotine yields will go down as you increase the packing density.

Q. Nicotine yields will go down slightly less than the tar yields, everything else being equal if you increase the packing density?

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A. Probably nicotine yields will decrease to a slightly lesser extent than tar yields will.

Q. Did the amount of plasticizer effect the tar and nicotine yields?

A. I do not believe so, no.

Q. What is the purpose of plasticizer?

A. The plasticizer is a mild solvent for the cellulose acetate, and when we apply the plasticizer, it softens the fibers so that when they contact one another they bond, and the purpose of the plasticizer in that mechanism is to increase the rigidity of the filter so it has some feel, substance to it.

Q. So that if you have a filter with less plasticizer, are you saying that it should not effect the tar and nicotine yields?

A. There shouldn't be any effect, no.

Q. Who specifies which particular filter goes on which particular cigarettes at Reynolds? Is that a function of research, quality assurance or both?

A. It is a research and development department function.

Q. Do you know approximately how many different filter designs Reynolds utilizes?

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A. No, I don't.

Q. Is it dozens or less or more?

A. I don't know.

Q. Are there different porosity of tipping papers?

A. Yes. You can have different porosities or permeabilities is another term for it, of tipping paper.

Q. And there is different porosities of plug wrap?

A. Yes. You can have different porosities or permeabilities for plug wrap.

Q. And we've talked about different porosities for cigarette paper, correct?

A. Yes, sir.

Q. And would the same be true with respect to all three of those; tipping paper, plug wrap and cigarette paper, that the permeability effects the amount of air dilution or ventilation that occurs?

A. Yes, it does.

Q. Has Reynolds purchased its cigarette paper from Kimberly Clark in the past?

A. Yes. We did purchase cigarette paper from Kimberly Clark. I'm not sure whether we still do

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that.

Q. What different types of tobacco does Reynolds utilize in its cigarettes?

A. We use burley, flue-cured, Turkish. We have expanded tobacco, which is a processed material from tobacco and reconstituted tobacco.

Q. Is there an oriental tobacco?

A. Oriental and Turkish are the same thing.

Q. Everything else being equal, and tell me if it's an unfair question, does the nicotine and tar contents of these various tobaccos vary?

A. Well, first of all, tobacco doesn't contain any tar. It does contain nicotine.

Q. Let's break it up. In terms of nicotine content, content as opposed to yield, is there any general principles that you can make with respect to these five different types of tobacco that you listed that rank them in terms of nicotine contents?

A. I'm not an expert in tobacco and its composition; however, I can say that reconstituted tobacco has less nicotine than the other types that I've listed off. Expanded tobacco, I think has less nicotine content. I'm not sure that I know which of the remaining

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three, how they would range in nicotine content.

Q. Do you teach in your cigarette design course general principles of nicotine contents of the various types of tobacco?

A. No.

Q. Who decides which type and how much of the various tobaccos in each different type of cigarette manufactured by Reynolds?

A. That's a R and D activity or function.

Q. Does Reynolds use the same amounts or varying amounts of burley, flue-cured and Turkish tobacco in its products?

A. To the best of my understanding, we have fairly set ratios of the different types of tobaccos, and we do make some variations in expanded tobacco content, depending on yields in particular cigarettes, tar and nicotine yields, but flue-cured, burley, Turkish are all roughly the same proportion brand to brand.

Q. Well, does all of Reynolds' cigarettes, do they utilize all three types; burley, flue-cured and Turkish, do all of Reynolds' cigarettes utilize all three of those types of tobaccos?

A. So far as I know, yes.

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Q. There is not a cigarette, for example, that is all burley?
A. No, there's not.
Q. Or all flue-cured?
A. No, there's not.
Q. Can I refer to them, Reynolds' cigarettes, when I refer to blended cigarettes, is it okay to refer to that as using the three types of tobacco that you just mentioned?
A. So far as I know, that is a good definition for a blended cigarette. It contains burley, flue-cured and Turkish.
Q. And it is your understanding, that all the cigarettes contain roughly the same amounts of each?
A. No. That's not my understanding. What I said was, from a brand to brand basis, the ratios of those three tobaccos are about the same, but they are not equal proportions of them.
Q. Explain that for me.
A. Well, if you compare the blend of say a Vantage cigarette with a Camel cigarette, the percentages of flue-cured, burley and Turkish are probably about the same between those two cigarettes, but there is not a third Turkish, a

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third burley, a third flue-cured. That's what I meant by the proportions within a cigarette are not the same between or among the three different types of tobacco.

Q. Okay. But whatever it is, if there is one fourth flue-cured, one fourth burley and half Turkish, are you saying that those proportions roughly remain the same throughout the cigarette brands?

A. So far as I know, yes. Roughly proportionate.

Q. Are you saying throughout Reynolds' cigarettes or throughout the different brand families at Reynolds?

A. Throughout our cigarettes.

Q. So regardless of cigarette, if I chopped up and analyzed, I would find, regardless of brand or the type, et cetera, I would find roughly the same ratio of flue-cured, burley and Turkish in each cigarette?

A. So far as I know, we don't have a lot of variation in those ratios.

Q. Within the particular types of tobacco, flue-cured, for example, do you know if there is different nicotine levels of flue-cured

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tobacco in terms of content?

A. Well, flue-cured tobacco or any other tobacco can have variation in nicotine contents for a number of reasons.

Q. When research and design, is it research and development that sets forth the specs for each cigarette?

A. Yes.

Q. When they set forth a spec for a particular cigarette, do they specify a particular nicotine content of each of the three types of tobacco that are utilized? I'm talking about three types; flue-cured, burley and Turkish.

A. I don't know.

Q. Where does Reynolds store its tobacco?

A. You know, I don't know where our facility is for storing the tobacco.

Q. What year did you start at Reynolds?

A. 1976.

Q. Have you ever been to the facility where Reynolds stores its tobacco?

A. I've been to our steamery, which is north of town, and I believe we store some tobacco

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there. We store some tobacco on the premises of where we manufacture cigarettes. We have two locations where we manufacture cigarettes, one is at Whitaker Park, one in Tobaccoville. I don't know where else we would store tobacco. There may be another place.

Q. Where is the expanded tobacco made?

A. I believe we have a plant at Whitaker Park that manufactures that.

Q. Where is the reconstituted tobacco made?

A. We have a plant at Whitaker Park where we manufacture reconstituted tobacco.

Q. Are they separate plants?

A. I believe so.

Q. Is there only one plant for both expanded and reconstituted, one each?

A. I don't know. We may have a similar plant at Tobaccoville.

Q. What knowledge do you have of the expanded tobacco process?

A. I know the basics of how the process works, and I have more knowledge of what the effects of using the tobacco are on the yields of cigarettes.

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Q. When did Reynolds first utilize expanded tobacco?

A. It was in the 60's, I believe.

Q. What was the original purpose of utilizing expanded tobacco?

A. We had two purposes for using expanded tobacco. One was as an additional tool to reduce tar and nicotine yields from cigarettes. The other one is since you are displacing the same volume with less weights of tobacco, it is a cost savings.

Q. When expanded tobacco was first utilized at Reynolds, was it the cost savings or the reduction of tar that was the primary motivating factor for the use of expanded tobacco?

A. I don't know.

Q. Describe for me what you know about the expanded tobacco process.

A. Well, the current process we use employs carbon dioxide as the expansion agent, and the way the process works, my understanding, is tobacco is impregnated with liquid carbon dioxide, which is very cold, then the impregnated tobacco is then pressurized to a degree that

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solidifies the carbon dioxide and the pressure is released. That effects an expansion of the tobacco. By expansion, I mean the same weight of tobacco occupies about twice of the volume that it would have had it not been expanded.

Q. Which of the three tobacco types that we've talked about, and I want to distinguish tobacco types; flue-cured, burley and Turkish from expanded and reconstituted, okay?

A. Okay.

Q. So when I talk about tobacco types, I want to limit it to natural tobacco types, unless I say otherwise, okay?

A. Right.

Q. Which of the three tobacco types are utilized in the expansion process?

A. I believe we use mostly flue-cured tobacco.

Q. How long has Reynolds utilized carbon dioxide?

A. I don't know. Several years.

Q. What did they utilize before carbon dioxide?

A. We use a halogenated carbon dioxide, Freon.

Q. Freon 11?

A. I don't know which Freon was used.

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Q. Does Reynolds still utilize Freon in its manufacturing process?

A. Not that I'm aware of.

Q. Does Reynolds utilize anything other than carbon dioxide to expand its tobacco?

A. Not that I'm aware of.

Q. Does it utilize different levels of carbon dioxide in its expansion process?

A. I don't know.

Q. Are there any other compounds or additives that are used in the expansion process other than carbon dioxide?

A. I'm not aware of any.

Q. Does Reynolds simply expand its tobacco leaves or does it use the expansion process on other portions of the tobacco plant?

A. I think that in the expansion process I described there may be some stem parts in the tobacco that goes into that process.

Q. So the expansion process include the stems?

A. So far as I know, there may be some stems in there.

Q. There is not a separate expansion process for the stems?

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A. I know that we've been researching a process for stems. I'm not -- I'm pausing because I'm not sure that that is in any commercial practice right now.

Q. If the tobacco is expanded roughly twice the size as a result of the expansion process, what effect is there, approximately, on the tar and nicotine yields, not yields, contents?

A. Well, there is no tar in the expanded tobacco.

Q. Nicotine?

A. You have to make a cigarette out of it and smoke it to get the tar.

Q. The nicotine?

A. Well, on a weight for weight basis there is a reduction and you get some loss of nicotine from the process, so there is a reduction in the nicotine content as well.

Q. What is the approximate loss?

A. I don't know.

Q. Has Reynolds done tests to determine the amount of nicotine lost in the expansion process?

A. I would presume that we've measured

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nicotine on the in-feed material. That's the material that is pre-expanded, and the nicotine content of the expanded material. I haven't seen any of those data.

Q. You don't know of at least a rough ball park ratio of the amount of nicotine loss as a result of the expansion process?

A. No. I do not recall looking at any of those data.

Q. Does it vary depending upon the type of tobacco that is expanded?

A. I don't know.

Q. What portion of the tobacco Reynolds utilizes is expanded?

A. I don't know.

Q. Why doesn't Reynolds expand all of its tobacco?

A. Well, I think one reason is that when we expand the tobacco, you take something away from it and you reduce the smoking quality of it. If you made cigarettes out of a hundred percent expanded tobacco, it would be less acceptable to smokers. Another reason we don't expand all of our tobacco is we simply don't have the manufacturing capacity to do that.

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Q. Is there expanded tobacco in all of Reynolds' cigarettes?
A. So far as I know, all of our cigarettes contain expanded tobacco.
Q. Do you know what the range is in terms of total content of cigarettes?
A. Yes. The range would be from about ten percent by weight of the tobacco blend up to around 30 to 40 percent by weight of the tobacco.
Q. Do certain brand families have more expanded tobacco than others?
A. Not brand families, but brands within a family may have different expanded tobacco contents.
Q. And that's a function of research and development, they decide how much expanded tobacco is used?
A. Yes.
Q. What is the determinative factor as to how much expanded tobacco is used in a particular cigarette?
A. Well, one determination is the tar yield that we want for the particular cigarette that's being designed, and in general, we use higher expanded tobacco content in lower yield

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cigarettes. Another consideration is acceptability of the taste of the finished product among the smokers who want that cigarette.

Q. Do you have cost cutter brands?

A. Yes. We have low tear, low price tear brands.

Q. Do they contain more expanded tobacco?

A. I think they do, yes.

Q. Are there different types of expanded tobacco put in each cigarette, in other words, if that ten to 30 percent is made up of expanded tobacco, can there be different types of expanded tobacco in that ten to 30 or 40 percent?

A. So far as I know, we only make one type of expanded tobacco.

Q. And that was flue-cured?

A. I believe it was primarily flue-cured tobacco.

Q. And there is different nicotine content of flue-cured tobacco, is there not?

A. I don't understand what you mean, different.

Q. I mean you could have flue-cured

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tobacco with certain nicotine contents, say ten milligrams by weight, and you could have some that is 14 milligrams by weight, could you not?

MR. BELASIC: Object to the form.

THE WITNESS: Well, flue-cured tobacco -- well, let me back up. Tobacco nicotine content can vary from a number of factors; where is the tobacco grown, what is the climate for that particular crop year and harvest, what is the grade and variety of the tobacco. So when you say flue-cured tobacco can vary in nicotine content, the answer is yes, and it is going to vary depending on a whole lot of factors, including where it was grown, the agricultural conditions that were used to grow it, the climate conditions, the grade of the tobacco, the quality level. All of those things influence what the nicotine contents of a tobacco is, flue-cured included.

BY MR. MAISTROS:

Q. Okay. My question then is, if I'm down in the plant and I want to manufacture a batch of cigarettes on any given day and I call up the expanded tobacco plant in Whitaker Park, wherever it is located, and say send me over

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eight tons of expanded tobacco, can I specify the nicotine content?

A. I do not think so, no.

Q. So they are just going to send over eight tons of expanded tobacco and they are not going to know what the nicotine content is?

A. Well, I don't know whether the people in the plant know what the nicotine content of expanded tobacco is, but I think if you are in the manufacturing area and you need expanded tobacco delivered, you cannot ask them to give you a certain nicotine content expanded tobacco.

Q. So on the spec sheet for any given cigarette, when it says expanded tobacco, there is a percent in each cigarette that's all it says is a percentage, it doesn't specify a nicotine level or type of expanded tobacco?

A. Again, so far as I know, we make one type of expanded tobacco, and I don't know of any specification for nicotine on the expanded tobacco.

Q. If I went down to the manufacturing plant today or the storage facility, would there be a bin full of flue-cured tobacco that all has the same nicotine content?

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A. Well, I don't know. I don't think so.

Q. I mean, when your buyers go to the market, don't they buy different flue-cured tobacco with different nicotine levels?

A. Well, buyers may buy tobacco with different nicotine levels, but it is not a consequence of them knowing what the nicotine level is when they buy the tobacco. Tobacco buyers are trained to recognize different grades of tobacco by feel and smell and touch and color and they don't know what the nicotine content of the tobacco is that they are buying.

Q. So at these sales, the Reynolds buyers do not know the nicotine content of the tobacco they are buying?

A. I don't see how they could.

Q. When is the first time Reynolds knows the nicotine content of the tobacco it purchases?

A. I'm not familiar with the process by which we bring the tobacco in from the auction and inventory it, but at some point after we bought the tobacco and warehoused it, we do make a measurement of sugar content of the tobacco and the nicotine content of the tobacco.

Q. Do you measure anything else?

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A. I'm not aware of anything else we measure.

Q. Do you measure the hydrogen content?

A. No.

Q. Nitrogen content?

A. We may at some point measure the nitrogen content, but I don't think that's a routine type of measurement.

MR. BELASIC: This is Stephanie Parker, from Jones, Day, for R.J. Reynolds Tobacco Company.

(Ms. Parker entered the deposition.)

THE WITNESS: Is this a good time to take a break?

MR. MAISTROS: Do you want a break?

THE WITNESS: Yes. I feel the need.

MR. MAISTROS: Any time you want. It's not an endurance test.

(RECESS TAKEN)

BY MR. MAISTROS:

Q. Before we go onto reconstituted tobacco, I want to back-up a minute if I might, and revisit the issue of cigarette paper.

We talked about the filter and the wrap and the paper. Are there any other variables that you can think of that effect

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either nicotine or tar yields that I didn't discuss with you?

A. With regard to the paper?

Q. Paper, the filter or the wrap.

A. Well, yes, there are.

Q. What are the other variables?

A. One thing we didn't discuss is the additives that we use on cigarette papers that can moderate the burn rate of the paper to a degree, and we typically employ an alkaline metal citrate salt on cigarette papers that has the effect of making the cigarette burn somewhat faster, and as a result of that, you get lower yields of tar and nicotine.

Q. The faster the cigarette burns the lower the tar and nicotine yields, generally?

A. Generally that's true, yes.

Q. Is there any other purpose or function of the additives on the paper?

A. Yes. In addition to moderating the burn rate, the additive has the effect of enhancing the ash appearance, and without these additives, the ash from the cigarette can be flaky and wants to fall off, and putting the alkaline metal citrate salt on lightens the ash somewhat and

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makes it more cohesive so it hangs on the coal a little better.

Q. Does Reynolds use different levels of additives depending upon the cigarette it is manufacturing?

A. Yes, we do.

Q. Why are different levels used?

A. Again, if we're comparing say an ultra low tar category cigarette with a full flavor type of cigarette, I believe our practice is to put somewhat more of this alkaline metal citrate salt on the ultra low tar cigarette paper, and again, the purpose of doing that, is to help us get to the ultra low tar yield.

Q. Are different additives used?

A. As far as I know, right now we only use alkaline metal citrate.

Q. Is that used on all of Reynolds' cigarettes?

A. I believe it is, yes.

Q. So the amount of alkaloid metal citrate is specified by R and D on each cigarette?

A. Yes, it is.

Q. Anything else that effects nicotine

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tar yields that we didn't talk about?
A. With regard to the paper and the ventilation system, I don't think so, no.
Q. How about with regard to any other aspects of cigarette design?
A. Yes. There are some factors that effect tar and nicotine yields that we did not discuss.
Q. And what are those?
A. One is dimensions of the cigarettes, and by that I mean, the length of the tobacco rod and the length of the filter. The diameter of the tobacco rod and the diameter of the filter. The weight of tobacco, the weight of tobacco that is in the tobacco rod.
Q. Everything else being equal, as the length of the rod increases, so does the tar and nicotine?
A. All else equal, if you increase the length of the tobacco rod, you will increase the yield of tar and nicotine.
Q. All else being equal, if you increase the length of the filter, will you decrease the tar and nicotine yields?
A. Yes. If you increase the length of the filter, keeping everything else constant, you

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will decrease the tar and nicotine levels.

Q. All else being equal, if you decrease the diameter of the tobacco rod, what will happen to the tar and nicotine yields?

A. Probably if you keep everything else equal, you'll decrease the yield of tar and nicotine.

Q. And if you decrease the diameter of the filter, will you decrease the tar and nicotine yields, everything else being equal?

A. It is not necessarily so that if you decrease the diameter of the filter you will decrease the yield. You might predict an increase in yield.

Q. What is the relationship between weight of tobacco and the rod and tar and nicotine yields?

A. Generally speaking, all else being equal, if you increase the weight of the tobacco rod, you will increase the tar and nicotine.

Q. Any other factors that we haven't discussed that effect tar and nicotine yields?

A. I can't think of any other factors right now.

Q. If I wanted to, I could, could I not, make your lowest tar and nicotine cigarette and

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your highest tar and nicotine cigarette from the exact same tobacco and just modify with other factors we've discussed?

A. I think that you could make the same tar and nicotine yield numbers by not modifying the tobacco content, but I don't think you would make the same tasting cigarette.

Q. I'm just talking about the yields. If I wanted to, I could make your lowest tar and nicotine yield cigarette and your highest tar and nicotine cigarette out of the very same tobacco, not the taste, but the yields?

A. Again, if you are confining this hypothetical cigarette to yield numbers only, yes, you could.

Q. Let's talk about the reconstituted tobacco process. When did Reynolds first employ reconstituted tobacco?

A. In the early 50's.

Q. What was the purpose?

A. Well, I think the purpose of using reconstituted tobacco at that time, was to reclaim tobacco that wasn't normally useful in making cut filler to go in tobacco rods.

Q. Cost saving measure?

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A. In essence, yes.

Q. What type of tobacco has historically been used in reconstituted tobacco?

A. So far as I know, we use all types of tobacco in reconstituted tobacco.

Q. Are stems included in reconstituted tobacco?

A. I believe so, yes.

Q. How many different types of reconstituted tobacco does Reynolds currently manufacture?

A. I don't know.

Q. How many different types has Reynolds manufactured in the past?

A. I don't know.

Q. Could you describe what you know about the reconstituted tobacco process?

A. Well, the process of making reconstituted tobacco is, we take pieces of tobacco that aren't of the size range that is suitable for use in making cut filler, extract those tobacco pieces in water, and the water extraction removes everything that's soluble in water under the temperature conditions and concentration that is used in this process, including the nicotine.

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The water extract is separated from the pulpy part of the tobacco, and this is the cellulose and pectin and the structural part of the tobacco. That material, the pulp material is essentially put out onto a moving belt from which the remaining water is drained, and you get a relatively dry paper like material. The water extract then is reapplied to this paper material that is diced and put into our normal cutting operation with the natural tobaccos.

Q. Once the water is applied, is the water that's applied to the tobacco heated?

A. I believe that when we do the water extraction, the temperature is elevated.

Q. Is there anything in the water that's applied to the tobacco?

A. I don't understand the question.

Q. Well, you have these leaf products and stem products running through water, right, or is the water sprayed on it? Tell me how it works.

A. Well, the way it works is, we take the tobacco pieces, put that in water and make an extract. Then the extract is separated from the pulp. The pulp is used to make a paper and then

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the water extract is put back on the paper that resulted from the pulp.

Q. At the beginning of the process, the water extract, does it contain anything other than water?

A. All the water soluble materials from the tobacco.

Q. Before the tobacco is put in the water, is there anything in the water?

A. Not that I know of.

Q. As the water solubles are removed, are they put through a filter? Is anything added to the water solubles after they are removed?

A. Not that I know of.

Q. Is the content of the water soluble tested in this process?

A. I don't know.

Q. Where is the water soluble stored?

A. I don't know that it is stored. My understanding of this process is, you make the extract, you make the pulp and put it back together again are rather a continuous process.

Q. When the water is reapplied to the tobacco, is there anything added to the water?

A. Not that I know of.

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Q. When the water is reapplied to the tobacco, is there anything that's also reapplied to the tobacco at the same time?

A. Well, again, the water that I think you are referring to, is this water extract?

Q. Right.

A. That contains the water soluble material that came from the tobacco to begin with, so, yes, it does contain the water soluble materials that came from the tobacco.

Q. In addition to the water soluble materials that came from the tobacco, is there anything else that's added when the water solubles are added back onto the tobacco?

A. No. Not that I know of.

Q. So as far as you know, the water extract that's removed from the tobacco, from the point in time it is removed until the point in time it is put back on the tobacco, there is nothing added to that extract material?

A. So far as you know, there is nothing added to the extract material.

Q. Now the tobacco has had the extract removed, that's moving on the conveyor belt before the extract is reapplied. Is there

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anything done to that tobacco?
A. There might be, depending on the formulation of the reconstituted tobacco.
Q. What might be done?
A. I believe that's the point wherein certain formulations -- we put some diammonium phosphate for the purpose of strengthening the linking between the cellulose impectinacious parts of the pulp.
Q. Is there anything else that's added to the tobacco?
A. Not that I know of.
Q. What is the purpose of diammonium phosphate?
A. It is to help strengthen the sheet, primarily.
Q. Does it have any other purpose?
A. We have used diammonium phosphate for the purpose of facilitating reactions between sugars and the ammonia part of diammonium phosphate.
Q. What is the purpose of creating those reactions between the sugar and the ammonia part of the diammonium phosphate?
A. We believe the reaction products between ammonia and sugars are flavorable, so the purpose

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for doing that is to try to get a more flavorable cigarette.

Q. How did Reynolds come to believe that the reaction between the ammonia and sugar made a more flavorable cigarette?

A. Well, I'm not an expert in flavor chemistry, but to the best of my understanding, there is a number of reports in the literature in the field of flavor chemistry that talk about browning reactions, carmelization reactions, reactions between sugars and ammonia or carbohydrates and ammonia, all resulting in aromatic or flavorful materials, whether it is related to tobacco products or not, and so far as I know, we have been trying to follow that line of reasoning and have concluded that under certain conditions you can get a more flavorful cigarette if you have these reactions occur.

Q. To your knowledge, diammonium phosphate is the only thing added to the tobacco at this point in the process?

A. As far as I know, yes, and diammonium phosphate is only added to some of our G7 formulations, not all of them.

Q. Why is that?

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A. As part of our product development process, we will go in and take a particular cigarette brand, go through some research to improve it and if we find that, for example, a diammonium phosphate treated reconstituted tobacco improves the flavor of that particular cigarette, we may opt to use it commercially, and that's why we end up with multiple formulations of reconstituted tobacco in commercial practice.

Q. What percentage of Reynolds' cigarettes utilize reconstituted tobacco?

A. As far as I know, all of our cigarettes have reconstituted tobacco.

Q. What is the range of total weight of tobacco?

A. Roughly 20 to 25 percent of the total weight of tobacco is reconstituted.

Q. Did Reynolds expand its reconstituted tobacco?

A. So far as I know, we do not.

Q. What are K stems?

A. I presume what that refers to is burley stems. Our designation for burley is K.

Q. Do you know what G7-25 is?

A. I do not. G7 refers to reconstituted

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tobacco. The 25 number refers to a particular formulation.

Q. And you don't know how many formulations Reynolds utilizes?

A. No, I don't.

Q. As part of the reconstituted tobacco process, does Reynolds measure the nicotine content of the reconstituted tobacco sheets?

A. We may. I don't know whether we do or not.

Q. Are there varying nicotine contents in the different reconstituted tobacco sheets?

A. Again, there may be some variation. I would expect there would be some as a consequence of how we manufacture the material, the in going tobacco is of different nicotine content, you would expect the finisned product, the finished G7 to have a different nicotine content.

Q. What is NH3?

A. That's the chemical formula for ammonia.

Q. Are there different levels of ammonia applied to the reconstituted tobacco depending upon the type of reconstituted formula it is?

A. Again, we have different formulations of reconstituted tobacco. Some formulations don't have any ammonia at all. I'm aware of one

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formulation that I know has diammonium phosphate in it. I'm not sure whether that has any ammonia applied to it.

Q. Which one has diammonium phosphate?

A. I don't understand your question.

Q. You said you are aware of one formula that has diammonium phosphate.

A. I don't know what our designation for that formula is. I think there exist one that we use commercially that has diammonium phosphate in it.

Q. Is the PH of the water soluble extract measured in the process?

A. I don't know.

Q. Isn't the ammonia used primarily to adjust the PH of the water soluble extract?

A. I don't know. I'm not aware of using ammonia to adjust anything in the water soluble extract.

Q. You think it is used just to make the sheet easier to work with and for some taste characteristics?

A. Yes. I know of two reasons to use ammonia or ammonia containing compounds of G7. One is to increase the strength of the sheet. The other is to facilitate formations of flavorful reaction

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products that we think improve the flavor of the cigarettes.

Q. You don't think ammonia is used in any fashion to effect PH levels?

A. No, I do not.

Q. The reconstituted sheet that does not contain ammonia, isn't that of less strength than the reconstituted sheet with ammonia?

A. It may be.

Q. And doesn't it have less desirable taste characteristics than the reconstituted sheet that uses ammonia?

A. Well, what I said before was, in the process we go through to improve the flavor of our cigarettes, we will work with a particular brand. We found in the case of the brand that uses the ammonia treated or the DAP treated reconstituted sheet, that the flavors are improved there. That didn't mean that the flavor of cigarettes with the reconstituted tobacco that does not contain ammonia is inferior to the taste of the other cigarette.

Q. When this tobacco pulp material is dried, do you know what the nicotine content of it is, before the water extract is put back in?

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A. No, I don't. It is very low, but I don't know what the number is.

Q. I mean, is it to the point where it would be referred to as denicotized tobacco?

A. Again, I don't know what the level is. I just know it is much lower than the in going tobacco would be.

Q. Does Reynolds have denicotized tobacco?

A. We do not use any denicotized tobacco right now, I don't think.

Q. Has Reynolds used denicotized tobacco?

A. In the past we had a process of taking some of the nicotine out of burley tobacco and we employed that commercially for a number of years. I do not believe we continue to do that at this time.

Q. What was that process called?

A. KDN.

Q. What was the purpose of taking the nicotine out of the tobacco?

A. My understanding is, that we felt that the burley that was available during that time frame resulted in harsher tasting cigarettes, so we

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used a process to remove some of the nicotine from that burley tobacco.

Q. Was the KDN process something that had a separate manufacturing facility?

A. I don't know.

Q. How was it different from the reconstituted process?

A. Well, the KDN process didn't involve the water extract and the reapplication of the pulp. What they did there was treat the strip burley, strip tobacco to remove some of the nicotine. There is no reconstitution involved in that at all.

Q. What did Reynolds do with the nicotine it removed in the KDN process?

A. I presume it was incinerated as it went out the stacks, the exhaust stacks from the manufacturing facility.

Q. What is the REST process?

A. The REST process was a research effort aimed at determining if we could take water soluble extract from tobacco and then process those to remove selected constituents from the water soluble material and then reapply the treated extract to tobacco.

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Q. Was it ever used commercially?
A. I don't think so, no.
Q. Was one of the goals of the REST process to control the nicotine level of tobacco?
A. I wasn't involved in the research work on the REST process. My understanding was that it had a broader objective than what you said, namely to selectively remove different constituents from extracts from tobacco, one of them could have been nicotine. It could have been other constituents, but I think the research objectives for that were broader than just nicotine.
Q. In addition to the ammonia, is sugar added in the water soluble process, the extract that's reapplied to the tobacco, is sugar added, is that what you said?
A. In reconstitution of tobacco?
Q. Yes.
A. We do not add any sugar, as far as I know.
Q. What is acetaldehyde?
A. Acetaldehyde is a carbonyl compound that is in the vapor phase of cigarette smoke.
Q. What is it?
A. It is a carbonyl compound. It is a member

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of a class of chemicals called carbonyls. It is found in the vapor phase of cigarettes, the smoke, one place.

Q. Have you done any research on acetaldehyde?

A. I haven't done any research on acetaldehyde. I've done work on filter modifications that change or reduce the yield of acetaldehyde in smoke.

Q. Do you know of any association between acetaldehyde and nicotine?

A. No, I don't, other than the fact that some of the modifications we talked about today that effect yield of tar and nicotine, also effect yield of acetaldehyde; for example, if I increase the ventilation in the filter of the cigarette, I reduce not only the tar yield, but the acetaldehyde yield.

Q. Are there any compounds that are added in the cigarette manufacturing process that have the effect of effecting the acetaldehyde yields?

A. Not that I'm aware of.

Q. Do you know if the level of acetaldehyde in smoke has any effect on nicotine

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transfer rates?
A. No, I don't.
Q. Do you know what G7-BC is?
A. G7 refers to reconstituted tobacco. I don't know what the BC stands for.
Q. Do you know what G7-1 is?
A. I believe G7-1 is the first formulation that we started with years ago for reconstituted tobacco.
Q. Do you know what G7-A is?
A. G7-A is a reconstituted tobacco that has some ammonia applied to it.
Q. When does Reynolds decide to use ammonia versus DAP?
A. Well, as best as I understand it, the DAP is an additive that's put in the pulp of reconstituted tobacco for the purpose of making the sheet stronger. The G7-A process refers to using ammonia to facilitate these flavor reactions with the sugars that are present in the reconstituted material.
Q. So you think they use DAP for strength and ammonia for flavor?
A. To the best of my understanding, yes.
Q. Does the ammonia, to your knowledge,

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have any effect on the nicotine yields of the cigarettes?

A. I don't believe it has any effect on the nicotine yield of the cigarette.

Q. Has Reynolds done any research to determine if the amount of ammonia has any effect on the nicotine yield of the cigarettes?

A. I'm aware of some research on effects of using ammonia in various processes. I'm not clear on whether we have done any research on the effect of ammonia on nicotine yield per se.

Q. What research are you aware of?

A. Well, again, I'm aware in general of some work on effects of ammonia on flavor of cigarettes, on facilitating reaction between sugars and ammonia, but I don't recall ever seeing any reports on ammonia contents of tobacco versus nicotine yield from the cigarettes.

Q. Is there any association or connection between the use of ammonia and the amount of acetaldehyde?

A. I'm not aware of any connection between ammonia and acetaldehyde.

Q. Is there any connection between the amount of acetaldehyde and the amount of sugar in

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tobacco?

A. Theoretically, if you change the carbohydrate content of the cigarette sugar or change the paper composition or that, you might predict an increase in acetaldehyde. In general, acetaldehyde being one of those. Experimentally, I've never seen any documented increase in acetaldehyde as a function of sugar content of tobacco.

Q. I'm sorry, I didn't hear the last part.

A. I've never seen any documented increase in acetaldehyde as a function of increased sugar content of the tobacco.

Q. And it is your testimony that the use of ammonia or diammonium phosphate has nothing to do with attempts by Reynolds to achieve a certain PH level?

A. So far as I'm aware, no, it is not connected with PH.

Q. What is the PH range of a typical cigarette?

A. Cigarettes that we manufacture, PH of the smoke will range between five and a half and six and a half, I would say, but I want to say right

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now, that when we measure smoke PH, what we're measuring is the PH of a water solution with smoke dissolved in it, and there is considerable question as to whether that measurement reflects the PH of smoke particles, or the smoke as it exits from a cigarette.

Q. But Reynolds and Phillip Morris and American Brands all measure PH in the same manner, don't they?

A. I don't know how different tobacco companies measure PH.

Q. Is there any way you know of measuring PH other than the method you just described?

A. To the best of my knowledge, all the so-called smoke PH measurements are predicated on this water solution of smoke.

Q. And when you say there is a range of five five to six five, 5.5 to 6.5, is there a range below which Reynolds hopes to avoid in terms of PH?

A. My understanding of the smoke PH numbers is they sort of go where they go. I've looked at smoke PH measurements for one of our brands that were made from cigarettes that are manufactured

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from the 50's through the 80's, and what I see in that time course of PH measurements, is the range that I just told you. For one type of cigarette it bounces essentially randomly between 5.5 and 6.5.

I don't know that we have any measure or measure of control to have it any closer of a range than that or avoid a particular low end or try to get to a higher end or anything of the kind.

Q. Well, does the PH range of burley tobacco differ from flue-cured?

A. I don't know.

Q. Is the PH range a designed specification such as we talked about for filter specifications?

A. I'm not aware of any specification for PH.

Q. Is PH even taken into consideration in the reconstituted tobacco process?

A. I think I answered a question similar to that before, but I'm not aware of any PH measurement that's made in the reconstitution process.

Q. Do you know if there is any association between PH and nicotine transfer

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rates?
A. I don't know of any association between PH and nicotine transfer rates.
Q. Do you know what I mean by nicotine transfer rates?
A. I presume what you meant is the yield of nicotine divided by the nicotine content of the cigarette.
Q. For purpose of my question, I want you to assume that transfer rate is the rate at which nicotine flows from the mouth of a gas phase into the bloodstream. Okay. Do you know if there is any association between PH and transfer rate as I used it there?
A. No, I don't. I'm not a person with any expertise in physiology, and because I'm not well read in that arena, I don't know of any connection between PH of smoke and the type of transfer rate that you are talking about.
Q. Are you an expert in psychology?
A. No.
Q. Psychiatry?
A. No, I am not.
Q. You are not in physiology?
A. No, I am not.

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Q. You are not offering an opinion on whether or not nicotine is addictive?
A. I don't have any professional opinion about the addictiveness of nicotine or anything else for that matter.
Q. Or whether nicotine is a drug that could produce substance dependency?
A. Again, I'm not an expert in any of those fields that you mentioned. My expertise is in the area of cigarette design, and I can't offer any opinions about addictiveness of substances.
MR. BELASIC: Just to move things along, I'll confirm we're not going to produce Mr. Norman to testify on whether nicotine meets some definition of addiction or dependency or whether it doesn't. We got three experts, one of whom you deposed last week on those types of issues.
MR. MAISTROS: Okay.
MR. MAISTROS: Okay. We can break for lunch.
(RECESS TAKEN FROM 12:06 TO 1:08)
MR. BELASIC: We've had a wide variety of testimony on Reynolds' various cigarette manufacturing techniques, cigarette

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design efforts and certain references to Reynolds' cigarette formulas, and at this point, I'm going to designate the entire deposition to be protected as confidential under the protective order that's been entered in this case, the Hoskins case.

When I get the full transcript, I may designate more specifically certain items as confidential or highly confidential.

MR. MAISTROS: I'll object just on the basis of two things, number one, we went through the whole Townsend deposition without any such objection, and two, I don't think I've asked him anything that isn't already in most of his published papers or soon to be published papers, but I don't think that prevents you from designating what you believe is confidential, so.

BY MR. MAISTROS:

Q. Mr. Norman, in the reconstituted tobacco process, is there one type of process that you are familiar with or more than one?

A. There is at least two processes that I'm aware of. One involves the paper making process that we talked about earlier today, where we take a water extract from the tobacco and make a paper

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from the pulp and then reapply the extract. The other is referred to sometimes as slurry process or a cast process.

The essential difference there is there is no extraction involved. The tobacco is sort of homogenized and slurry cast on a non poroused conveyor belt and then dried and diced up for use in a cut --

Q. Which process came first?

A. So far as I know, the paper making type process came first.

Q. Why is the slurry process used over the paper making, or why are there two processes?

A. I'm not sure I know the answer to why there are. I presume that somebody has had a different idea of how you could make a reconstituted tobacco type material.

Q. In the slurry process as opposed to the paper making process, is diammonium phosphate used?

A. I'm not that familiar with that particular process. We've done some research on this cast or slurry process in R and D. I haven't been involved in any of that work. We don't use that type of material commercially at this time.

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Q. You don't use a slurry process to tobacco commercially?

A. I don't think so, no.

Q. Do you know when Reynolds ceased using it commercially?

A. I'm not aware that we ever used it commercially to begin with.

Q. What is a humectant?

A. Humectant is a material that's used to soften and moisturize the tobacco. An example might be glycerine.

Q. Glycerine?

A. Glycerine, yes.

Q. When are humectins applied to tobacco?

A. I believe during the casing process, and that's when we put together the strip tobaccos, that would be the burley, flue-cured and Turkish materials and the reconstituted sheet casing is applied right before the tobacco is cut, and I think that's where they apply humectin.

Q. You referred to the casing process. What is the casing process?

A. Well, casing is just a mixture of sugars, sometimes coco and licorice that's applied to the

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tobacco before the tobacco is cut.

Q. A casing is applied to expanded tobacco?

A. I don't think so.

Q. A casing is applied to reconstituted tobacco?

A. I believe so. I think that the reconstituted tobacco is combined with the strip tobaccos before cutting, and right before cutting is where the casing is put on.

Q. When are the flavorant added?

A. When I think of flavorant, I think of top dressing, and that's applied to the finished cut filler, and that's after the strip tobaccos are cut and the expanded tobacco is added to the blend.

Q. So the coco you referred to before, you don't view as a flavorant?

A. That's in the material we call casing. We have two applications of materials, one is casing, and that's typically a heavier application of somewhat different constituents than the top dressing. The top dressing is a lower level of application that has different kinds of flavorants.

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Q. Are flavorants only added to the top dressings?

A. There may be other applications of flavors. Again, it's not an area that I've been involved in. The main distinctions I have are the casing and the top dressing.

Q. On the reconstituted process and the paper making process you described, was it the ammonia or diammonium phosphate being added to the tobacco after the extract was readded?

A. So far as I know, if there is any ammonia applied to G7, it is after the G7-A finished or reconstituted tobacco is finished.

Q. So ammonia is not added to the water extract?

A. Again, so far as I know, any ammonia of reconstituted tobacco comes after the material is finished.

Q. And that would be the same for diammonium phosphate that is added after the reconstituted tobacco process is completed?

A. To my understanding, the diammonium phosphate is put into the pulp material that forms the sheet prior to reapplication of the extract.

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Q. Same as ammonia?
A. Diammonium phosphate is a compound that contains ammonia.
Q. So the diammonium phosphate is put into the pulp sheet before the water extract is applied?
A. That's my understanding, yes.
Q. And I asked you before if -- I might have asked for both, I'll ask just to be clear on the record. To your understanding, neither ammonia or DAP are used to effect PH?
A. To the best of my knowledge, neither compound is used for PH adjustment.
Q. What factors influence PH?
A. We're talking about smoke PH?
Q. Yes. Smoke PH, I'm sorry.
A. I think that tobacco type could play a role in smoke PH. Yield of nicotine in the smoke could influence smoke PH. Amounts of acids and bases present in the cigarette smoke could effect smoke PH, and I'll say again at this time, that the smoke PH that I'm referring to is the measurement made when you dissolve the whole smoke in water and measure the PH of the resulting solution. None of my comments are

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necessarily true about the particles of smoke, because I don't know of a way to measure PH of the smoke particles themselves.

Q. Is nicotine described as a volatile or nonvolatile or semivolatile substance?

A. I think you could refer to it as a semi volatile substance, and by that I mean, it has a fairly low vapor pressure and that means that there is not a lot of vapor present at room temperature, but it can be easily volatized.

Q. Is there an optimum tar to nicotine range of Reynolds' cigarettes?

MR. BELASIC: Object to the form.

THE WITNESS: I don't know that there is an optimum range. I know that the cigarettes that we manufacture have a tar to nicotine ratio that ranks from about ten to about 14.

BY MR. MAISTROS:

Q. Has Reynolds conducted tests to determine an optimal tar to nicotine ratio?

A. There may have been some research activity with the goal in mind of trying to find an optimum tar to nicotine ratio.

Q. How can the tar to nicotine ratio be altered?

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A. Well, I think there is a number of ways that you could alter the tar to nicotine ratio. One way, and the reason that we have the range that we do that I just quoted from about ten to about 14 is, that because filtration and air dilution and ventilation through the cigarette wrapper effect the yield of tar and nicotine to slightly different degrees, so when you put together a cigarette that's got say a high level of filter ventilation and a high filter efficiency, you may change the tar to nicotine ratio.

Q. Is that because of the fact that as you cited previously, that certain filter techniques effect the tar and nicotine yields differently?

A. Well, earlier today we talked about a lot of aspects of how filters can be changed, but the essence is, that no matter how you build a cellulose acetate filter, the efficiency for nicotine is slightly less than that of tar.

I'm not aware of any case where you can change the relative efficiencies of tar and nicotine. I think there is just always this gap between efficiencies of the two; however, in

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ventilation as you go up and in air dilution level, you do see changes in tar to nicotine ratios. The tar is being reduced as you increase filter ventilation, so is the nicotine, but they are being reduced at different rates, so that for a particular cigarette design, say for very low tar yields, you get somewhat lower tar to nicotine ratio than you would for a higher tar cigarette.

Q. So as air dilution goes up, tar goes down and nicotine does not go down as fast?

A. That's right.

Q. Now when we were talking about these nicotine yields, is that then your understanding as measured by the Cambridge filter?

A. Yes. The FTC test method that employs the Cambridge filter for smoke collection.

Q. Are you familiar with the manner in which nicotine is processed once it enters the body?

A. No, I'm not. I have no professional experience in physiology.

MR. BELASIC: And again, that's outside the scope of his expert report, and Mr. Norman will not be, and is not designated for

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that discussion.

BY MR. MAISTROS:

Q. Then you cannot offer an opinion as to whether or not the manner in which nicotine has been metabolized by the body changes depending upon the nicotine yields of the cigarette?

A. No. I can't offer an opinion about that.

Q. Nor could you offer an opinion at the rate with which nicotine is metabolized by the body?

A. No. I can't offer an opinion about the rate that nicotine might be metabolized.

(PLAINTIFF'S EXHIBIT NUMBER 1 WAS MARKED FOR IDENTIFICATION)

BY MR. MAISTROS:

Q. What I've marked as Plaintiff's Exhibit Number 1, this was a publication or paper you intend to have published or seek to have published, correct?

A. That is correct. It is submitted for publication in a monograph by CORESTA

Q. What is the monograph's topic?

A. The monograph deals with a variety of topics on tobacco.

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Q. Is anyone else from Reynolds contributing to the monograph?
A. I know for certain one of Reynolds' employees is one of the editors of the monograph. I don't know of anyone else that's contributed an article like this.
Q. Who is that?
A. Pardon.
Q. Who is the employee?
A. Layton Davis.
Q. What is his position?
A. He's a principle scientist.
Q. In what group?
A. He's in the brand R and D group.
Q. This is going to be published when?
A. We think some time in '98.
Q. Who did you have to run this manuscript by before you had approval to submit it to CORESTA?
A. It was reviewed by, I think, one of our internal counsel. It was reviewed by my immediate supervisor and her immediate supervisor and by Dr. Davis.
Q. Who are those people who is internal counsel?

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A. Gus Borski.

Q. And is this somebody assigned to research and development?

A. Yes.

Q. Is that the first person to review it?

A. I don't know who -- well, no. I take that back. My boss reviewed it first.

Q. Who is that?

A. Leslie Lewis.

Q. What is her position?

A. She's a master scientist.

Q. Who is her boss?

A. David Townsend.

Q. Did they make any changes?

A. Actually, I went through several edit and review processes with Leslie Lewis, and I made a number of changes based on discussions with her. I don't recall any changes that Dr. Townsend suggested.

Q. Do you have the previous drafts?

A. I do not.

Q. Do you have a file on this manuscript?

A. I do.

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Q. And there is no previous drafts in your file?

A. There may be a previous draft in that file.

Q. I would just ask that you retain it.

Did anyone assist you in this paper?

A. No.

Q. The tables and figures that you referred to in this paper, were those all done by you?

A. No.

Q. Who did those?

A. Well, if you look at the headings on the titles to the figures and tables, there is a reference number on most of them, and the ones that have a reference number, the reference number refers to the publication that I cited that that figure or table came from.

Q. Could you go to Page 48, please. At lines 10, 11 and 12, you write, "although the tobacco blend is certainly part of the overall cigarette design, blends are not typically formulated based on smoke yield of the different tobacco grades or types." What did you mean by that?

A. What I was trying to say there is that we

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don't choose tobacco types for their specific tar yield.

Q. Or nicotine yields?

A. To the best of my knowledge, we set our blend practices based on consistency and quality of the taste and smoke and smoking quality of finished product.

Q. So you don't select your tobacco blends based on either tar or nicotine yields?

A. No, we don't.

Q. Is that also true with respect to reconstituted tobacco and expanded tobacco, you don't select those types of blends based upon the tar or nicotine yields?

A. To the best of my knowledge, we don't select any type of tobacco for the specific yield of straight tobacco that you are going to put into the blend.

Q. Let's say, for example, you are going to make a Winston full flavor cigarette and you know that when it comes out of the plant and it goes on the shelves it has a certain tar and nicotine yield pre-established, I assume, correct, I mean, your Winston full flavor blends have specific tar and nicotine yields, do they

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not, a range, at least?

A. The finished cigarette has a tar and nicotine yield range.

Q. Right. When you begin that process before you get to the finished cigarette, is it your testimony that you do not take into consideration the tar and nicotine yields of the blends when attempting to arrive at a final tar and nicotine yielded cigarette?

A. I believe what I said before and, you know, referring back to this document is, people take one tobacco type, make cigarettes, measure tar yields and there are reports of that in the literature, and I refer to one in this paper.

We don't take that line of reasoning into account. When we design a cigarette like Winston, what we do is blend the tobaccos together, put a filter on, put ventilation in the filter that we think will result in the tar and nicotine yield that are part of the design objectives, and that's the finished product.

Q. Do you note the tar and nicotine yields of the tobacco blends before you select the filter?

A. Not necessarily, no.

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Q. Well, how do you know then what final tar and nicotine yields you'll get if you don't know what the tar and nicotine yields are of the tobacco before you select the filter?

A. Because you can study and understand the effects of the individual design elements like filtration efficiency and ventilation levels without having to measure the yields of the tobacco rod without any filter on it or without any aeration in it.

Q. You have filters -- I'm talking about the filter process. I'm talking about the whole range of variables that we talked about before, the compression of the cellulose acetate, the length of filter, et cetera, okay. You have a certain filter to go with a certain blend, don't you have to know the blend if you are going to make a guesstimate or calculation of the final end product tar and nicotine yields?

A. Again, not necessarily. If I know the tar and nicotine yield of a cigarette with a particular kind of filter on it and a particular level of filter ventilation, I can estimate what the yield change will be if I know the former cigarette and I know what changes I am going to

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make to the filter ventilation system.

Q. You can estimate the yield changes, but if there is a range of nicotine and tar levels in various tobaccos, those yield changes are going to produce different nicotine and tar yields depending upon what you started with, isn't it?

A. Again, not necessarily.

Q. So at what point in the process is the tar and nicotine content of the tobacco measured?

A. We don't measure tar content of tobacco. In fact, you can't.

Q. I'm sorry, you keep saying that, and I keep misstating it.

A. There isn't any tar in tobacco, there is nicotine in the tobacco.

Q. At what point in the process do you measure nicotine yield or content of the tobacco?

A. As far as I know, we make a measurement of incoming tobaccos that are going to go into inventory, nicotine measurement of incoming tobaccos for quality assurance purposes and for inventory control. For finished cigarettes, we make a routine measurement of nicotine content of

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the blends, finished blend.

Q. You just said you measure the incoming content of the nicotine.

A. Incoming content, nicotine content of the tobacco that we purchased.

Q. Right. So before the tobacco ever enters the manufacturing process, you know what the nicotine content of that tobacco is, do you not?

A. In some fashion, yes.

Q. So that when the plant calls up and asks for X amount of burley tobacco, you know what the nicotine content is before the cigarette is made; do you not?

A. I don't know how explicit that information is. We inventory tobacco by crop year, by belt and that's the geographic location of where the tobacco is grown, and by grade, and I don't know how they organize the sugar and nicotine measurements they make on incoming tobacco.

What our attempt is, since we're dealing with an agricultural commodity and trying to turn that into a finished consumer good that our customers expect to be fairly similar from year to year for the same brand of cigarettes, our

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inventory system is set up such they blend tobaccos so we get about the same blends every year.

Q. What I am trying to get at then is, if it is your testimony that that's how Reynolds does it, fine. In the broadest sense possible, I want you to tell me if before the manufacturing process begins Reynolds knows what the nicotine content of the tobacco is that goes in any given cigarette?

A. Well, I think that to a certain level of detail we do know the nicotine content of tobaccos before it goes into the manufacturing operation.

With respect to the nicotine content of the individual tobaccos that are going into any given cigarette, we don't know what the nicotine content is.

Q. What is your best selling cigarette?

A. Doral.

Q. Any particular type?

A. Probably within the Doral family, the Lights 100 is probably the best selling cigarette.

Q. What tobacco goes in the Doral Lights

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100?

A. I don't know the details of blend composition for Doral Lights 100.

Q. Well, at some portion of flue-cured, burley and Turkish, correct?

A. I don't know the composition of the blend in Doral.

Q. Well, you testified that all of Reynolds' cigarettes have each of those three types of tobaccos in them, right?

A. Yes.

Q. So at least we know that Doral has some portion of those three types of tobacco, correct?

A. I would say it probably has some of those three kinds of tobacco in it. It has some expanded tobacco in it. It has some reconstituted tobacco in it.

Q. The first shift comes in in the morning and they call up the warehouse and they say send over burley, flue-cured and Turkish tobacco, and my question is, does that plant or somebody at Reynolds know what the nicotine content is of those three tobaccos that go into Doral Light 100's?

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MR. BELASIC: Object to the form of the hypothetical.

THE WITNESS: Does somebody at the plant know?

BY MR. MAISTROS:

Q. Well, let's start at the plant. Does somebody at the plant know?

A. I don't know.

Q. Does somebody know at Reynolds?

A. With the hypothetical case that you just described, I don't know whether anybody would know in that situation or not.

Q. So Reynolds doesn't care what the nicotine content is of the tobacco that goes into each of its cigarettes?

MR. BELASIC: Object to the form.

THE WITNESS: I think we do care, and in the manner that I just described.

We work with an agricultural material. Our customers expect minimal variation in the cigarettes they buy from day to day, and what we try to do is set up a situation where we manufacture cigarettes with the closest formulation of tobaccos that we can give from year to year.

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As a matter of practice, our blends end up being about two percent nicotine by weight, and we try to keep it at about that level.

BY MR. MAISTROS:

Q. All of your brands have about two percent nicotine by weight?

A. There is some variation brand to brand around that number.

Q. Do all of your brands have the same nicotine yields?

A. No, they do not.

Q. What is your lowest nicotine yield cigarette?

A. That would be NOW, I would think.

Q. I'm sorry.

A. NOW is the name of the brand.

Q. How much nicotine is in NOW by yield?

A. The smoke yield of NOW is going to be less than .1 one milligram, I think, for the 85 millimeter cigarette.

Q. What is your highest nicotine content by yield cigarette?

A. I'm not sure.

Q. What is the amount?

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A. In the neighborhood of 1.2 milligrams or 1.3 milligrams nicotine.

Q. Is that also an 85 milligram cigarette?

A. Again, I would just be guessing, but I think probably Camel non filter is the brand that we make that's got the highest nicotine yield, and that is a 70 millimeter non filtered cigarette.

Q. Are you testifying that both of those cigarettes contain the same amount of nicotine by weight, about two percent?

A. They wouldn't contain the same amount by weight. They might have a very close concentration of nicotine. When you say percent by weight, that's a concentration, not an amount by weight.

Q. You said two percent nicotine concentration by weight. That was your across the board typical amount, correct?

A. I said roughly. There is some variation around that. In fact, the concentration of nicotine in the NOW may be a little bit less than that in the Camel Light.

Q. Would it be ten times less?

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A. No.
Q. Would it be five times as less?
A. No.
Q. Would it be two times less?
A. No.
Q. So it is very close?
A. Yes. As I said, there is some variation in there. It is not a lot.
Q. So if you have the close approximation of nicotine content by weight, how do you get a range of 12 in terms of the levels of nicotine by yield between NOW and this other higher yield cigarette you've referred to?
A. Well, if I'm right in my supposition that Camel non filter is in fact the highest nicotine yield cigarette, it doesn't have a filter, it doesn't have any filter ventilation and it has less expanded tobacco in it, and all of those factors that are in use in the NOW cigarette serve to reduce the nicotine yield of the smoke.
Q. Have you seen the design specifications for Reynolds' cigarettes?
A. Yes. I've seen some.
Q. What do they look like?
A. Well, it is typically pages on a spread

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sheet.

Q. What is down the left-hand column?

A. The ones I've seen don't necessarily have a left-hand column.

Q. What information is on the cigarette design specifications?

A. Well, the kinds of information that's in there would be the type of paper, cigarette paper that you use. Some kind of an internal commodity code for that paper. Same is true with the filter tow material that's used. The specification might also include pressure drop for the filter after it is finished. Tobacco weights filter dilution levels. There might be a blend identification code.

Q. Anything else?

A. There is probably some other things, but those are the ones that I can remember off the top of my head.

Q. Does it specify the tar classification?

A. Yes. We usually have a code for the brand style, and the brand style includes the tar category that the cigarette is in.

Q. Does it specify the rod length?

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A. Yes. It will have the specification for the tobacco rod length and the filter length as well.

Q. Does it specify the location of the lazar holes if lazar holes are used?

A. Well, if lazar holes were used, I think there is only one specification for the location.

Q. How about the size?

A. Probably in the case of lazar perforated cigarettes, the specification would reflect the ventilation level and not the size of the holes, and that's just based on the way we manufacture lazar perforated cigarettes.

Q. What is draft HO?

A. Draft HO refers to the pressure drop of the cigarette made with the ventilation holes open to the air.

Q. What is draft HC?

A. That is the pressure drop of the cigarette made with the ventilation closed to the atmosphere.

Q. Does it specify the chemical make-up of the cigarette?

MR. BELASIC: Object to the form.

THE WITNESS: I don't know what you

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mean by --
BY MR. MAISTROS:
Q. Moisture levels, menthol, nicotine levels?
A. For mentholated cigarettes, I think the specifications will include a menthol level as applied to the tobacco. There may be a specification for moisture content of finished cigarettes. I'm not aware of a nicotine content specification.
Q. You are not aware if it exist or you don't know?
A. I'm not aware of a nicotine content specification.
Q. What does the TP mean on a cigarette design spec?
A. TP may refer to tipping permeability.
Q. How about CP?
A. CP is probably refers to cigarette paper permeability.
Q. How about CFT?
A. I don't know what CFT -- I don't know what CFT means.
Q. How about cut filler tobacco?
A. Are you telling me that's what CFT means?

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Q. I don't know. Have you heard of that?
A. Cut filler tobacco, I know what cut filler tobacco is.
Q. What is that?
A. It's the tobacco ready to go into a tobacco rod.
Q. Does that include regular tobacco and reconstituted tobacco?
A. I believe so, yes.
Q. And expanded tobacco?
A. Yes, sir.
Q. Now these design spec sheets for cigarettes at Reynolds, do they contain a specification for the type of reconstituted tobacco?
A. I don't recall having seen that on any of our specifications or anything, but probably it does.
Q. Does it include a design spec for the type of expanded tobacco?
A. Again, I don't remember seeing that on any of our specification sheets, but it probably does.
Q. How many different types of expanded

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tobacco are there?

A. To the best of my knowledge, there is only one type that we use right now, but there could be other types that I'm not aware of.

Q. Let me show you what we'll mark as Exhibit 2, and ask you if you've seen this before.

(PLAINTIFF'S EXHIBIT NUMBER 2 WAS MARKED FOR IDENTIFICATION)

BY MR. MAISTROS:

Q. First of all, as you leaf through this document, do any of these pages look familiar to you?

A. Can you read the title to me because it is covered up.

Q. G7 process and product development progress.

MR. BELASIC: For the record, Exhibit 2 is a document that was produced by Reynolds in the Humphrey litigation in Minnesota and designated confidential in the Minnesota tobacco litigation. I think it says that on perhaps all the pages. Let me designate this document officially as confidential under the protective order in this case, the Hoskins case.

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BY MR. MAISTROS:

Q. Let's turn to some specific pages.

MR. BELASIC: Are you ready?

THE WITNESS: I would like to finish leafing through this.

BY MR. MAISTROS:

Q. If you could turn, please, towards the end, you'll see a very small number in the right-hand column, the last four digits of what say 7657. It probably, or at least it is on mine, it is four pages from the end. Do you see that little number 7657?

A. I see a number right there, 7657.

MR. BELASIC: Distribution from E.J. Steve Sohn at the top.

BY MR. MAISTROS:

Q. Who is E.J. Sohn?

A. Steve Sohn, he used to work in our process technology development group, and he's now assigned to another area.

Q. Do you see the page before this, 7856?

A. Yes.

Q. That is a distribution sheet, correct?

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A. Yes.

Q. And you are listed on there, correct, in the right-hand column?

A. Yes. I see my name on that column.

Q. Do you recall receiving this memo?

A. Let's see. This would have been April 1994?

Q. Yes.

A. I probably received it. I don't remember reading it.

Q. And you received it during the course of your employment at Reynolds?

A. Yes, I did.

Q. And go to Page 7858, please, which is entitled processed/reconstituted tobacco.

A. Yes, sir.

Q. Revised April 29, 1994.

A. Yes, sir.

Q. Do you see the item ID on the top left?

A. Yes, I do.

Q. And then description?

A. Yes, sir.

Q. And then codes C, E and D, representing current experimental and

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discontinued.

A. Yes, I see.

Q. Do you see the cigarettes they are used in -- do you see that where --

A. Yes, sir.

Q. What is R and M?

A. I do not know.

Q. Is that RH?

A. Excuse me, I just thought of what that might be, is regular and menthol. I think that's what that is.

Q. How about FF?

A. FF is full flavor.

Q. LL?

A. Light or low tar.

Q. ULT?

A. Ultra low tar.

Q. This sheet at least indicates, does it not, that as of April 29 of 1994, Reynolds utilized G71 in its regular and menthol full flavor light and ultra light cigarettes, correct?

A. Yes. That's what is indicated here.

Q. If you read down the list, I just like to list the ones that this sheet indicates that were currently then being used by Reynolds,

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it would include G7. Do you see that, G7-1 --
A. Yes, I see that.
Q. Below that, high stem content sheet?
A. I see something labeled G7-XX.
Q. G7-BC is a hundred percent flue-cured stem and scrap sheet?
A. I see that.
Q. Down quite a ways below that is G7-25, which is G7 heat treated extract plus DAP plus NH3, and NH3 is ammonia, right?
A. Yes, sir.
Q. Below that G7-27 is G7-XX is ammoniated extract, correct?
A. Yes, I see that.
Q. Below that is G7-28, which is G7-26 dust sheet without the DAP, correct?
A. Yes, sir.
Q. And then below that are 11 different types of reconstituted tobacco, all but two of which are shown to be currently then being used by Reynolds, correct, beginning with G29, all the way down to G -- I'm sorry G7-29 all the way down to G7-39, do you see that?
A. Yes. One of those is designated experimental. I think two of them are designated

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experimental.

Q. Would you agree that as of at least April 29, 1994, Reynolds was utilizing 16 different types of reconstituted tobacco by this document?

MR. BELASIC: Object to the form. To the extent your question includes R.J. Reynolds Tobacco International. You can answer.

THE WITNESS: Well, I haven't counted these. I assume your number 16 is correct.

BY MR. MAISTROS:

Q. Okay. Why don't you count -- tell me which one of these sheet tells you that are utilized by Reynolds?

MR. BELASIC: Same objection. You mean Reynolds, R.J. Reynolds Tobacco Company, or do you mean R.J. Reynolds Tobacco International?

MR. MAISTROS: Both.

MR. BELASIC: Then I'll object to question about the entity R.J.R. Tobacco International that's not a defendant in this case. You can answer.

MR. MAISTROS: We'll eliminate those. I think there is two.

MR. BELASIC: That's right.

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MR. MAISTROS: That would be G7-XX and G7-BC.

BY MR. MAISTROS:

Q. Other than those two, would you agree at least according to this document, all the others that have the C by them were being used by Reynolds in its commercially manufactured and sold cigarettes?

A. Yes. I would agree according to this document and the way they were designated they were used in commercial cigarettes.

Q. Were you aware in 1994 Reynolds utilized approximately 14 different types of reconstituted tobacco in its commercial products?

A. I was aware that we had a number of G7 formulations. I wasn't aware of the number.

Q. Go to the next page of this document. Back-up. If you back-up to I guess my number is 7859, do you see that, two pages before that distribution sheet, entitled process/reconstituted tobacco, revised April 29, 1994, and lists on this sheet expanded tobacco processes. Do you see that?

A. I have not found it.

Q. Okay. I'm sorry. 7859. It is seven

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from the end.

MR. BELASIC: I just object for the record to the completeness of this document, and also to the extent this document appears to be just from designation, multiple exhibits, different documents, three different documents that were combined together in one. I don't want the record to reflect an impression that this is a single document or it was stored in Reynolds' files this way.

THE WITNESS: 7859 process/reconstituted tobacco, revised April 29, 1994?

BY MR. MAISTROS:

Q. Right. Do you see on here where it lists the different type of expanded tobacco processes?

A. Yes.

Q. And do you see the ones that are designated as being currently used by Reynolds in 1994, with the C by them?

A. Yes, sir.

Q. Is it fair to say if you count the different expanded processes, that it appear on this sheet at least, they total nine in terms of

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currently being used in '94, I'm sorry, ten?
A. Yes. I count ten different designations, yes.
Q. Do you know what the GE14-4 expanded tobacco process is that utilizes U.S. offshore grown systems processed in the United States?
A. No, I do not. Well, as you said, it is a stem expansion process.
Q. If you go down to G19-8, do you know what the reference to 35 percent CRES is?
A. CRES stands for cut rolled expanded stems.
Q. Do you know why there is different expanded tobaccos that utilize different percentages of expanded stems?
A. No, I do not.
Q. Do you know if there is any comparison that could be made of the nicotine content of stems as opposed to leaves?
A. I think that the nicotine content of stems might be somewhat higher than the nicotine content of leaves.
Q. Now down below it says K sheet process, which is different than expanded tobacco process. What is the K sheet process; do you know?

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A. I can't read this title right above that section. It has got a stamp covering it up.

Q. I know, but if you look at CG 1913 there.

A. I can't read any of that column.

Q. Mine says K sheet process; and then it lists seven different types of G15's. Do you see that?

MR. BELASIC: Well --

THE WITNESS: Can you read that any better?

MR. BELASIC: If you are going to read it let's make sure that's the one that is marked as an exhibit.

MR. MAISTROS: 7859 in the right-hand column. Is that your little number?

MR. BELASIC: It is the same page.

BY MR. MAISTROS:

Q. We're on the same page, right 7859, do you see that?

A. Yes. 7859.

Q. I know this compilation of documents was marked as separate exhibits in other depositions. I've marked it as one exhibit. I haven't represented to you it is one document,

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have I? If I have, I don't intend to.

I'm just interested in this particular Page 7859, three quarters of the way down I can read it as K sheet process. I'll represent to you that's what it says. Do you know what that means?

A. Well, I'm aware of work on cast sheet.

Q. Maybe it says cast sheet?

A. I was trying to read that. I can't read that. If it says cast sheet, I'm aware of our work on that. In fact, that's the slurry sheet we talked about before, and we can see these are all marked experimental.

Q. The one below that says materials extrusion process. Do you know what that is?

A. No, I don't.

Q. How about tobacco deproteinization process?

A. I have some vague familiarity with that and that was a process where we were trying to take proteins out of tobacco and, again, it was experimental.

Q. What would be the purpose of taking the proteins out of the tobacco?

A. To try to alter the composition of the

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smoke.

Q. In what way?

A. So that you wouldn't get by-products of protein combustion in the smoke.

Q. Such as?

A. Benzopyrene, for example.

Q. Now, could you go to the upper right-hand corner, and mine has a three handwritten on it. It is back a little bit. It says revised October 10, 1991.

A. This is entitled processed/reconstituted tobacco?

Q. Right.

A. Revised October 10, 1991?

Q. Right.

Q. Do you see that?

A. Yes.

Q. If you go down, can you see the various symbols that are used for currently used, experimental and discontinued?

A. Yes, sir.

Q. Underneath G7-12B, do you see where it says RTS carbonized craft?

A. Yes.

Q. Do you know what that was?

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A. Yes, I do.
Q. What was that?
A. We were attempting to make a reconstituted sheet or a cast sheet that had carbonized cellulosis material in it.
Q. For what purpose?
A. The purpose of that was trying to reduce the tobacco content in the finished tobacco rod and the project that I'm aware of that was attempting this experimentally was one of our trying to develop a low sidestream cigarette.
Q. Was that ever successful?
A. No, it was not.
Q. Did you market a low sidestream cigarette in Japan?
A. We do, yes, sir.
Q. And how is that low sidestream smoke achieved in that cigarette?
A. We use a special wrapper design, actually, two wrappers, a double wrap system.
Q. Do you see down below towards the bottom it says propane expanded process G18-1?
A. Yes, sir.
Q. What was that?
A. I'm not familiar with that process. My

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understanding is, that we were trying some experiments with using propane to expand tobacco rather than carbon dioxide or Freon.

Q. If we could back-up two pages, I'm sorry, one page before that; mine says, looks like 4183. Is says project explanations at the top. Can you read what it says for REST-KDN?

A. I can only read part of it.

Q. Why don't you read what you can read.

A. Process by which whole or partial blend extracted supplemented with nicotine from the KDN process and reapplied to the blend.

Q. And there is some missing words after blend or stamped over words after blend, right?

A. Yes, sir.

Q. Best I can read is after blend it looks like have, but I can't read beyond that, either.

Are you aware of a project where extracted and then supplemented with nicotine from KDN process and reapplied to the blend?

A. I don't recall hearing about that before seeing it here today.

Q. Now, see the REST project down below there?

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A. Yes.

Q. Reestablishment of solubility to tobacco. It says removal of all water solubility from a tobacco source selective treatment of that acquiesce extract followed by reapplication to the insoluble portion of the blend. Was that process ever employed commercially?

A. I do not believe so.

Q. And that has no association or connection to either the reconstituted tobacco sheet or slurry process you referred to earlier?

A. Well, if implemented, such a process could be connected to it. I don't know what the intentions were had we implemented this REST process.

Q. Was it your testimony before, that nicotine is in the particulate phase, the vapor phase or both?

A. I believe what I said before is that nicotine is part of the particulate portion of smoke.

Q. Not the vapor portion?

A. Right.

Would you all mind if I took a break?

Q. No.

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(RECESS TAKEN)

BY MR. MAISTROS:

Q. If we could go back to the document. We were talking about the page before that. Mine has a sticker at the top that says Plaintiff's Exhibit 1153, or a stamp. Do you see that?

A. Handwritten in 1153?

Q. Right. It says project explanations.

A. Yes.

Q. It is probably the first page of the two page document that you looked at the last page just a minute ago.

Now the first project explanation says WA. Have you heard of that?

A. Yes. I have some recollection of work in that area.

Q. What is project WA?

A. Well, what it says here, WA was a designation for a polyester webb, that as I recall, was used in filters, and this webb apparently was treated with an acid solution.

Q. What does the last sentence say?

A. It says, filter reduces vapor -- I think it is vapor phase. It's covered by this stamp. The filter reduces vapor phase smoke components that

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effect smoothness, mainly vapor phase nicotine.

Q. Is vapor phase nicotine a concept that you are familiar with?

A. I've heard people refer to vapor phase nicotine, yes.

Q. And I believe you've testified you don't believe that nicotine exist in the vapor phase?

A. I think that most, if not all the nicotine is in the particulate part of smoke.

Q. Was this a product that was actually used by Reynolds?

A. No, it was not.

Q. The bottom of the left, do you see G7-KDN?

A. Yes, I see that.

Q. And that says process by which nicotine from the KDN process is added to G7. Do you know if that was utilized by Reynolds?

A. I don't know if that was used by Reynolds.

Q. Now on this sheet it shows G7-26. Do you see that?

A. Yes, sir.

Q. It says G7 with extract treated with three percent DAP and heat prior to reapplication

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to the base webb. Now G7-26 was utilized by Reynolds, was it not?

A. I don't remember whether it was on that list that you just showed me that had it designated as such.

Q. If you could go forward a couple of pages, two pages, there should be a blank page and then another page. The title says G7 process and product development programs additional applications. Do you see that?

A. Yes, sir.

Q. Have you heard of the rich sheet?

A. I don't recall hearing about rich sheet before seeing it here.

Q. How about XB?

A. XB, I do recall.

Q. What was that?

A. XB was a product development project where we were trying to alter the tar to nicotine ratio of cigarettes.

Q. Through the G7 process?

A. Well, the G7 process is one option I think they were looking at. I was not actively involved in the XB project, but I know some of the things they were doing on that.

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Q. Below that it says flat sheet technology. What was that?

A. Well, I haven't heard it referred to in that way, but from the description down here it appears that what they were talking about was trying to make a paper sheet that you could -- excuse me, a tobacco sheet that you could wind to a bobbin for use in manufacturing cigarettes with tobacco wrappers, for example.

Q. And below that it says provide real wound flat sheet to support advance product development-XDU. What is XDU?

A. XDU was an internal code for Premier development, continued development after the test market.

Q. How about XA.

A. XA was a low sidestream cigarette.

Q. What does the X mean in all of these codes?

A. I don't think it has any meaning.

Q. How about advanced cigarette paper?

A. I don't know what they are referring to there.

Q. If you go back again, there is no easy way to find it. It is a chart like five

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pages forward. It says G7-25 process flow. Now, G7-25 is a type of reconstituted tobacco; is it not?

A. Yes.

Q. And at least if you go to the chart at the end of this document it shows it was in commercial use in April of 1994. You can go back and confirm that if you want. Page 7858 which is three from the end.

A. This document does say G7-25 was in commercial use in 1994.

Q. Does this document describe any process you are familiar with, the one that says G7-25 process flow?

A. No, it does not.

Q. On the first box it has extract sheet heated for one hour at 205 degrees Fahrenheit. Have you ever heard of that?

A. No, I have not.

Q. And then it has a line, cool to 130 degrees Fahrenheit. Do you see that?

A. Yes. I see that.

Q. Do you see the box up at the top with the two little arrows going in, DAP going in, what is that?

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A. DAP is diammonium phosphate.

Q. You got a little arrow with NH3 going in, what is that?

A. NH3 is ammonia.

Q. What does it say inside the box?

A. It says extract PH adjusted to 6.0 with NH3.

Q. Is that any concept that you are familiar with?

A. Well, conceptually, it appears that what they've done is add the ammonia to adjust the PH, so the concept is from basic chemistry.

Q. They've also added the diammonium phosphate, have they not, to adjust the PH?

A. Well, in this particular case I'm not sure that the DAP would do anything to the PH.

Q. And then it has an arrow going out after those additions, that say extract applied to base webb. Do you see that?

A. Yes.

Q. Would this chart at least indicate that the ammonia was added to the extract to adjust the PH?

MR. BELASIC: Object to the form.

BY MR. MAISTROS:

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Q. You can answer it.
A. It is not clear to me why they added the ammonia here. I mean, you could take this as they added the ammonia to adjust the PH.
Q. What does it say inside the last box?
A. Extract PH adjusted to 6.0 with NH3.
Q. Do you think that means something other than they adjusted the PH with the use of ammonia?
MR. BELASIC: Object to the form. Now you are asking him twice to speculate about a document that he didn't write, and what it means. If you know, you can answer.
THE WITNESS: Well, I don't know anymore than what I just said. What this document says right here is that the extract was adjusted, the PH was adjusted to 6.0 with ammonia. Whether or not the reason for adding ammonia was to adjust the PH, I have no idea.
BY MR. MAISTROS:
Q. Do you know what brands utilize G7-25?
A. No, I do not.
Q. Do you know what brands utilize G7-A?
A. No, I do not.

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Q. Could you go forward one page. I'm sorry, back one page. What is the title of that document?

A. G7 process and product development programs.

Q. What is the objective?

A. In part, a smoother less harsh character to RJR brands through G7 modifications.

Q. What are the technical approaches listed?

A. One is extract through heating. Another is DAP addition and in parentheses it says PH adjustment.

Q. Is it your testimony, that still you know of no association between the use of DAP and the adjustment of PH?

A. Well, this document certainly refers to using DAP in some form to adjust the extract PH.

Q. Who at Reynolds would have the most knowledge of why Reynolds uses DAP?

A. I would say persons who were actively involved in development of G7 processes.

Q. Who is that?

A. One would be Grey Flinchen.

Q. Anyone else?

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A. Another would be Watson Dufour.
Q. Anyone else?
A. Those are the individuals I recall.
Q. I believe that Dr. Townsend would know why Reynolds uses DAP?
MR. BELASIC: Object to the form.
THE WITNESS: I don't know whether Dr. Townsend would know that or not.
BY MR. MAISTROS:
Q. Do you know who Gary Huber is?
A. I've heard the name.
Q. Where have you heard it?
A. Most recently I saw his name in the newspaper.
Q. Where?
A. Do you mean which newspaper?
Q. Yes.
A. Winston-Salem Journal.
Q. What was that about?
A. The newspaper article was about Gary Huber's research funding via the tobacco industry.
Q. Where else did you hear his name?
A. I may have heard his name in the R and D department on occasion. I think he's done some

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research connected to environmental tobacco as well.

Q. Did you know who Wallace Hayes is?

A. Yes, I do.

Q. Who is he?

A. He was the former director of our toxicology department at R and D.

Q. Do you know why he left Reynolds?

A. I do not know, no.

Q. Do you know who David Ibister is?

A. Yes, I do.

Q. Who is he?

A. He was a -- I believe he was a director of our processed technology and development department and then he became some form of technology director for the company.

Q. Do you know why he left Reynolds?

A. No.

Q. Where did Reynolds purchase its diammonium phosphate?

A. I don't know.

Q. Which department is in charge of purchasing diammonium phosphate?

A. I would presume the purchasing department takes care of that.

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Q. Do you know who is in charge of that department?
A. I do not know, no.
Q. Did you testify earlier that reconstituted tobacco makes up to 50 percent of typical cigarettes?
A. No, I did not.
Q. Did you use the 50 percent somewhere in there?
A. No, I did not.
Q. Do you recall if I asked you what percentage of a typical cigarette is reconstituted?
A. I believe you did ask me that question, yes.
Q. Was it 20 to 30 percent?
A. I believe my response to your original question was between 20 and 25 percent.
Q. And for expanded, it could be up to what?
A. I think expanded contents can be as high as 30 to 40 percent.
Q. So a typical cigarette has anywhere from 50 to 65 percent reconstituted and expanded tobacco?

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A. I wouldn't say that would be a typical cigarette. A cigarette could have, when you add together the 20 to 25 percent reconstituted plus 30 to 40 percent expanded tobacco, it could be what is that, 65 percent.

Q. 20 to --

A. That's not a typical cigarette. That's cigarettes in the ultra low tar category.

Q. Have you done any research with respect to the issue of whether or not smokers of ultra low tar cigarette compensate during their smoking to obtain more nicotine?

A. I have done some research on puffing behavior of smokers while smoking ultra low tar cigarettes. What I mean by puffing behavior is the volume of the puff taken while they are smoking a cigarette and the frequency of puffing, the duration of puffing.

Q. What has your research found?

A. Well, my research has found that people who smoke ultra low tar cigarettes use somewhat higher puff volumes and they may puff slightly more frequently than, for example, smokers of low tar cigarettes.

Q. Have you done research to determine

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the psychoactive effects of nicotine?
A. I have not been involved in any research having to do with psychoactive effects of nicotine.
Q. Have you done any research to determine why smokers of ultra low tar cigarettes have higher puff volumes and take more frequent puffs?
A. I'm not sure that I could characterize any work that we've done in that arena as pointed towards why peoples' smoking behavior changes in that way when they smoke lower tar cigarettes, no.
Q. Are lower tar cigarettes typically lower nicotine cigarettes?
A. Yes, they are. The trend is such that when we reduce the tar yield we reduce the nicotine yield. They follow one another in rough proportion.
Q. Why were you researching or looking at the puff behavior of ultra light smokers?
A. Well, we're interested in smoking behavior for understanding purposes how do people use our product.
Q. Has Reynolds calculated the nicotine

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intake of smokers of ultra light cigarettes versus full flavored cigarettes?

A. I don't know that we know how to calculate intake based on the kinds of data that I just told you about. Whether we have or haven't, I don't know.

Q. Do you know what a coatening is?

A. I think coatening is a metabolite of nicotine.

Q. Can you measure the coatening levels in smokers?

A. I think you can measure coatening in smokers' blood and you can measure coatening in urine from smokers.

Q. Can you measure coatening and arrive at some conclusions as to nicotine intake of a smoker?

A. I'm aware of research reports where people have purported to do that, yes.

Q. Hasn't Reynolds done that?

A. I don't know whether we've done any coatening studies at Reynolds or not.

Q. You began in 1976, was it October?

A. October of 1976.

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Q. How did you end up at Reynolds?
A. I came here actually right before I finished my graduate school and had a job interview. I liked the place and I decided to take a job here if they offered it.
Q. Who interviewed you?
A. Mary Stowe, Don Piehl. Those are the individuals that I recall.
Q. What was Mary Stowe's title?
A. I think her title at that time was section head.
Q. What section?
A. I can't remember the name of that group.
Q. Was there a chemical section?
A. As I recall, there was a chemical division and an analytical division within the research department, and in those days, we had a separate research department and a separate development department, and realize this is 21 years ago, so my recollection may be a little hazy, but we had a chemical division, which had a manager, and the manager of the chemical division was Don Piehl, and then reporting to Don Piehl were section heads. Mary Stowe was one of the section heads in the chemical division.

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Q. And you were hired as a --
A. Junior chemist.
Q. Junior chemist. You held that position until when? We have a CV, by the way, attached to the report, if that helps.
A. That would be a help.
MR. MAISTROS: Let me mark the report as three.
(PLAINTIFF'S EXHIBIT NUMBER 3 WAS MARKED FOR IDENTIFICATION)
BY MR. MAISTROS:
Q. If you turn to Exhibit 3, which is your report, at the back it lists your years of employment, positions held.
A. Yes.
Q. It says junior R and D chemist. Now when you say R and D chemist, are you stating that there was a research and development department at Reynolds in '76?
A. No. As I described, there was a separate research department and a separate development department, and when I said junior R and D chemist, I typed this fairly recently and I may have just done that in error.
Q. So more accurately you were a junior

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research chemist in '76 to '79?
A. Yes. I think that probably is more accurate.
Q. What did you do in those almost three years at Reynolds, '76 to '79?
A. I worked on projects related to selective filtration, and by that I mean, trying to identify and understand agents that I could put in filters that would remove specific constituents of smoke. I also worked on designing some cigarettes that would have particularly low carbon monoxide yields for the amount of tar yielded. I also did some work on how to measure filter ventilation.
Q. Did you work with Dr. Rogman at all?
A. Dr. Rogman was the head of the research department, and he was my boss about two levels up, so I knew him, but I didn't work too much with him.
Q. Did you develop any agents that were utilized in filters that you subsequently received a patent for?
A. Not during that time period, no.
Q. What type of chemicals were you attempting to selectively remove?

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A. As I recall, we were interested in classes of compounds like carbonyls, and we were trying to remove those as a class and not in particular any one. Another compound I recall was that we were interested in removing were oxides of nitrogen.

Q. Did you ever manufacture, ever come up with any additives that were used in a commercial process?

A. No.

Q. Did you ever come up with or try to come up with any additives or agents that were used to selectively reduce nicotine?

A. No.

Q. Did any process you worked on in '76 to '79 ever get incorporated in any commercial cigarettes?

A. Not that I'm aware of, no.

Q. In 1979 you became an associate chemist?

[redacted] sir.

[redacted] And your resume says R and D chemist. Is that truly what you were, or were you just a research chemist?

A. Well, I think somewhere in that '79 to 1980

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time frame, the research and development departments were combined, so our titles started reflecting the fact that we had a combined research and development department.

Q. Who was in charge of R and D at that time?

A. I think around 1979 Roy Morris was the head of R and D.

Q. Was there a separate person for research and a separate person for development?

A. When we combined the two departments, I don't think so. I think we had a different type of organization.

Q. Give me your chain of command above you in that time period.

A. Well, I think my immediate supervisor was Janet Wheeler, and I'm trying to recall who her supervisor or who her boss was at that time. It may have been Don Piehl, but I just don't remember.

Q. What was your group called?

A. The group that Janet has is called filter and materials.

Q. What did you do in this '79 to '81 time period?

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A. Well, I continued work on researching ways to measure air dilution, ways to construct filter ventilation systems, understanding the way filter modifications influence tar yields.

Q. Did you explore at all how filter ventilation systems effected nicotine yields?

A. Well, typically when we do an experiment where we modify the filter ventilation system we'll measure tar and nicotine yields, so yes.

Q. In this time period did you measure anything other than tar and nicotine yields?

A. I may have.

Q. Like what?

A. Well, again, you know, the FTC method, once you do that test, you automatically get carbon monoxide and carbon dioxide, so it is fairly routine, if we measure tar and nicotine, we get those two, and whether I measured anything else in the smoke would depend on exactly what the experiment was.

Q. Was all of your work in this time period on filtration?

A. No. As I mentioned ventilation system, how you build them, how do you specify the materials. Probably during -- well, I may have done some

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work on smoking paper during that time period as well.

Q. Did you work with the group that was known as biobehavioral?

A. Yes. That would be the work that I just referred to on smoking behavior.

Q. Who did you work with in biobehavioral?

A. The head of that group was John Reynolds.

Q. Do you know what the primary commercial goal of that group was?

A. I do not know.

Q. Did your group have commercial goals?

A. The filter material group had, I think, a stronger connection to any commercial aspects than the biobehavioral group did.

The filter material group, part of its charge was to learn how to better specify the materials that were used in cigarettes, and by that I mean the filter materials, the paper materials, tippings, that sort of thing.

The biobehavioral group is more what I would term fundamental research. It is work done to understand more about the product and how smokers use it.

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Q. Within the biobehavioral group is there a group or a department?

A. I guess you would call it a group, because it wasn't, I mean, the research and development organization is a department and the biobehavioral group is a part or a subdivision of that department.

Q. Have you heard of the blood chemistry group?

A. I didn't know there was a blood chemistry group. I never heard of that.

Q. Was there a nicotine analog group?

A. I don't know whether there is a group called nicotine analogs. I know there has been some work done on nicotine analogs.

Q. Is there a biochemistry group?

A. I don't recall hearing of a biochemistry group.

Q. Were you in filter materials? Was there a group directly above that, was it like advanced products or just research?

A. I think at the time the next subdivision larger than the filter and materials group was applied R and D.

Q. How did you work with Reynolds in

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biobehavioral when you were in the filters material group?

A. Well, when I came to work at Reynolds, I was in John Reynolds' group, and his group was concerned with air dilution and filtration and the type of work I described from 1976 to 1979.

When we reorganized to combine the research and development parts into one department, John Reynolds went into another area called biobehavioral. I was transferred into this new filter and materials group under a new management, but since I had started some work with John on smoking behavioral oriented research, I stayed with that project, yet continued on some projects in filters and materials at the same time.

Q. What prior experience did you have in smoking behavior?

A. None.

Q. And before joining Reynolds, did you have any experience with respect to tobacco?

A. No, I did not.

Q. Or nicotine?

A. No, I did not.

Q. Or the principles of science related

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to human behavior?
A. No, I did not.
Q. What training did you receive before you started working with John Reynolds on smoking behavior?
A. None.
Q. What was your role in the smoking behavior studies?
A. Well, my first job was to design and build the computer system and the instrumentation used to measure the puff volumes, puff frequencies and puff durations, and since I constructed that computer system and equipment, I went out and helped them make the measurements.
Q. Reynolds did not have equipment designed to measure puff volume frequency, et cetera, before you did this?
A. They had what I would call a pilot scale facility to do that. What that consisted of is a computer attached to one device for measuring flows while people were puffing on cigarettes. That did not allow people freedom of movement to move the cigarette around in a more or less natural way and the computer and its software had some severe limitations to making the

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measurements.

Q. Was your device patented?

A. For the device for measuring smoking puff volumes?

Q. Yes.

A. No. That was not patented.

Q. How long did you work on that project?

A. To the best of my recollection, two or three years. Probably not continuously.

Q. Were you doing other work during this period of time?

A. Yes, I was.

Q. What type of work?

A. Well, again, the type of work I was doing throughout my time at Reynolds has been on the materials that are used in cigarette construction, how do you specify them, how do you arrange them to get a particular tar yield from a cigarette.

Q. Have you worked on materials used in cigarette construction to get a specific nicotine yield from cigarettes?

A. I don't know how to use the construction parameters that I'm aware of to get a particular

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nicotine yield. That's a consequence of both how you construct the cigarette and what the nicotine content of the tobacco is.

Q. Well, did you consider when you said that you worked on materials used in cigarette construction to get a particular tar yield, did you consider perforated paper, perforated filters a material?

A. Well, perforated filters would be a combination of materials. Perforated paper is a material in and of itself.

Q. You've testified already today, that those factors; perforation, perforation location, or size and number of holes effect nicotine yields; do they not?

A. They do.

Q. So would you not consider your work related to filtration, permeability, et cetera, also related to nicotine yields?

A. Yes. They are related to nicotine yields in the manner I described earlier. Nicotine is part of tar. When I do something to effect the tar yield, I effect the nicotine yield.

In my experience, and in the work that I do, we always talk about tar yield. That's the

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major determinant in our product design, is what we talk about when we adjust the cigarette design to change the yield of smoke, tar yield.

Q. Now your resume says that you became a R and D chemist in December of '81.

A. Yes, sir.

Q. How did your job change?

A. I believe during that time I stayed with the same group and I was doing primarily the same kind of work and, in fact, throughout this whole string of promotions and years, I have stayed with the same kinds of work while at Reynolds. It was working on the materials that go into cigarettes, modeling of materials on smoke yields, ment work, either centered on trying to improve the flavor of cigarettes or trying to achieve some particular reduction of smoke yield and the principal difference in this list of promotions is level of responsibility.

From time to time I've had people reporting to me, part of my own group. In fact when you get to a level of master scientist, the expectation is that you leave research, whereas at junior levels, you are primarily going by what

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people have assigned you to do.

Q. Who was your supervisor when you became a R and D chemist?

A. I think that was still Janet Wheeler.

Q. Did you do weekly reports?

A. I may have at that time period. I don't remember.

Q. Did you do monthly reports?

A. I don't recall doing monthly reports.

Q. Did you do quarterly reports?

A. We have done quarterly reports in the past. I don't recall whether we did them at the time period.

Q. You have done quarterly reports while you were at Reynolds?

A. Yes.

Q. Were you still working with John Reynolds in biobehavioral in the '81 to '83 time period as a research and development chemist?

A. I believe I may have, yes.

Q. What type of work?

A. Pretty much what I described before, still helping them with measurements of smoking behavior.

Q. Was John Reynolds familiar with the

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phenomena that ultra light smokers took longer and more frequent puffs?.

A. I believe he was familiar with that, yes.

Q. Were you the first one to figure that out?

A. No.

Q. Who was?

A. I can't recall the person's name, but there are reports in the literature that predate our work in this area.

Q. Is it a recognized principle at Reynolds, that ultra light smokers take longer and more frequent puffs?

A. Well, first of all, ultra light smokers don't take longer puffs. They may take bigger puffs, bigger volume puffs. The duration is about the same as any other smokers of other type of cigarettes, more frequent.

Q. Okay.

A. I don't understand what you mean by generally recognized.

Q. Has anyone at Reynolds published anything that quarrel with the proposition that ultra light smokers take bigger volume puffs more frequently than smokers of regular?

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A. Did you say quarrel?

Q. Yes.

A. I'm not aware of anything published that would take exception to that.

Q. Everything else being equal, if you take a bigger volume of puffs, will you take in more tar and nicotine?

A. If by taking in you mean ingest or inhale more tar and nicotine, there is no way to tell based on the types of measurements we've been talking about. In other words, if you measure the puff volume, puff frequency and puff duration used to smoke a cigarette and then try to replicate that smoking process on a similar type of cigarette, you will see the yield go up, but that may or may not be a reflection of the amount inhaled.

Q. Do you think as a general proposition if you take bigger puff volumes of smoke you are going to inhale more smoke?

A. Again, I don't know that there is any way to tell from knowledge of how big a puff you take how much you are going to inhale.

Q. Well, the FTC testing measure that average a typical puff as how many milliliter?

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A. In the FTC, the puff flow is 35 milliliters.

Q. That's for two seconds?

A. The puff duration in the FTC test is two seconds.

Q. If you inhaled for four seconds as opposed to two seconds, do you think you might inhale a greater amount of milliliters of smoke?

A. Well, we were discussing FTC smoking procedures, and that doesn't have anything to do with how much a person inhales.

Q. Okay. Let's go to the FTC for a moment. If the duration of puff is four seconds as opposed to two seconds, do you think you are going to get more smoke than you would if you had the two second puff?

A. If you keep the puff volume constant and you increase the puff duration from two seconds to four seconds, you might well get less smoke yield out of the cigarette.

Q. Per puff?

A. Per puff.

Q. What have the tar and nicotine levels done since say 1980 across the board, mean average of tar and nicotine yields, cigarettes

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manufactured by your company, have they gone up, gone down, stayed the same?

A. Sales weighted average of R.J. Reynolds since 1980?

Q. Yes.

A. I don't think I know what R.J. Reynolds' sales weighted numbers have done since 1990.

Q. How about the industry?

A. Industry has declined some.

Q. How about since 1985?

A. Again, I don't have those numbers in my head. I don't know.

Q. If you looked at your Exhibit 1, your publication, would that help you?

A. Yes.

Q. Why don't you take a look at that.

A. Figure one, Page 82.

Q. Figure one of Exhibit 1, can you tell me what the sales weighted average FTC nicotine yields have been since 1985?

A. It is approximately flat at about .8 or .9 milligrams.

Q. It has been flat since what year?

A. Maybe 1983 or '84.

Q. Since 1983, the nicotine levels of

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all cigarettes, mean average sales weighted average of all cigarettes in the United States has remained about the same?

A. The sales weighted average nicotine yields of cigarettes since 1983 is approximately flat.

Q. Stayed the same?

A. Yes, sir.

Q. And do you know why that would be?

A. It could be a number of factors.

Q. Why don't you tell me which ones you believe it is.

A. Well, one factor is this is sales weighted average. What that means is, in order to get that average, you take the nicotine yield of each cigarette sold in the United States, multiply that yield by the share market for that particular cigarette, then sum up those multiplied products to get the sales weighted number. Since that sales weighted number is comprised by both sales and yields, this could reflect the mix of the marketplace.

Q. You see in your chart there was a decline for the years preceding '83, correct, for nicotine?

A. Yes.

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Q. In fact, according to your chart, there was a decline in nicotine yields ever since 1956, correct, or '55?

A. From this chart I would say that there has been a decline up through about 1983.

Q. And according to your chart, I see you list what I'll call production techniques, filters, reconstituted tobacco, increased use of porous paper and expanded tobacco, correct?

A. Yes.

Q. Has there been any production techniques that you think are significant since 1965 or '66?

A. Yes, I do.

Q. What are those?

A. Well, one example is the Premier technology that we test marketed in 1988.

Q. That's not that significant, those cigarette sales wouldn't be on this chart, would they?

A. No, they wouldn't be. It was on the test market.

Q. Are any commercially successful product design achievements that you would list on this chart that you don't have listed?

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A. The Eclipse is another product that is currently in test market that reflects, I think, significant advances in product design.

Q. And that would factor into the sales weighted average?

A. It wouldn't at this time, because it is in test market.

Q. Is there any commercially sold product that has a design criteria that you would consider significant that you haven't listed on this chart?

A. I don't believe so, no.

Q. So the last significant development at least is this -- by the way, is it fair to say, I can't tell, it looks about '66 expanded tobacco came into use?

A. I believe it was somewhere in the time frame from '66 to '68.

Q. Can you tell me again, why do you believe that the nicotine yield by sales weighted average have not changed much at all since 1983?

A. Well, I think the major reason is this flat curve reflects the mix of products in the market. What we have right now and have had since 1973, excuse me, 1983, and even before that time, is

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we've designed and manufactured and sold cigarettes that have a range of tar and nicotine yields. We probably talked about some today. I think I remember mentioning one end of our range for nicotine yields about 1.3, the other end is about .1 milligrams, so in essence, we've spanned a wide range nicotine yields and tar yields with the products we manufacture and sell.

What is left, is how many people the cigarettes in the different categories of tar and nicotine yield and what you see here is a reflection of '96 of sales between higher and lower tar cigarettes.

Q. You have a range of nicotine products back in the 70's, didn't you?

A. Yes. And I think that the proliferation of ultra low tar cigarettes began in the mid to late 70's.

Q. And is it fair to say looking at this chart, that the average nicotine yield by sales weighted average would be approximately somewhere in the area of .9 milligrams of nicotine?

A. Well, from this scale it appears to me it could be somewhere between .8 and .9.

Q. And it has never fallen below that,

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correct?
A. Could you repeat the question?
Q. The average sales weighted sales of cigarettes, nicotine yields have never fallen below .8 and .9?
A. There may have been dips and swings along the way that fell below that.
MR. MAISTROS: Why don't we take a break.
(RECESS TAKEN)
BY MR. MAISTROS:
Q. If we can go to Exhibit 1. It is not numbered, but there is a chart in there right before Page 87. It is called figure five.
A. Yes, sir.
Q. Now this is captioned reduction of smoke yields with perforated cigarette paper, correct?
A. Yes, it is.
Q. Could you describe for me this chart?
A. This shows the percentage change in several smoke constituents, including CO, NO which is nitrous oxide, tar, the total vapor phase in nicotine, the total change in yield of those constituents as paper permeability perforated is

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increased.

Q. And do I read this correctly to mean that for example, across the upper left-hand column there is a percent change, you are talking about a decrease in the yield of those components, that's what that graph represents on the left?

A. Yes.

Q. From zero to minus 40 percent?

A. Right. In the cases where percent change is a minus number there's a reduction in the yield relative to the reference point.

Q. Now, do I read this chart as showing that the nicotine yield of cigarette smoke actually for awhile increases as you adjust the permeability of the paper?

A. Well, I would have to get a ruler and straight edge out to see if this reflects an increase. It would be an awfully tiny increase.

Q. But out of the components that are measured here; nicotine, tar, nitrogen oxide and carbon monoxide, the only one that doesn't decrease from the yields is, at least until you get to about 100 in terms of permeability, the only one that doesn't decrease the yields is

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nicotine; is that correct?
A. That's correct.
Q. This is showing a range, is it not, of anywhere from nine to ten puffs?
A. Yes, it is.
Q. Would you select nine to ten puffs because you believe that is the typical range of puff count of a typical smoker?
A. No one selected the puffs on this chart. First of all, this chart came from an article written and presented by Bill Owens, and what the puff count range is there down at the bottom, are measured puff counts for the cigarettes that he tested.
Q. I see.
A. I don't know if these cigarettes reflect any typical cigarette. Probably knowing Bill Owens as I do, he made some cigarettes with these different papers, they are unfiltered cigarettes and he tested them for the smoke yields indicated and floated them on the curve here.
Q. Why do you include this chart in your paper?
A. To differentiate the effects of perforated paper permeability from those inherently porous

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paper permeability which is shown in figure three in this document.

Q. Two figures before?

A. Yes.

Q. So if you compare these two charts, there is a general proposition, is it a fair statement to say, that the perforated cigarette paper will have -- I'm sorry, let's start over.

The first chart shows just inherently permeable cigarette paper?

A. Figure three shows the effect of inherently permeable paper porosity variations on yield reductions of various smoke constituents.

Q. And nicotine, nitrogen oxides, carbon monoxide and tar, there is a somewhat correlated percent change in those four compounds as the permeability increases, correct?

A. That is correct.

MR. BELASIC: Object to the form.

MR. MAISTROS: I'm sorry.

MR. BELASIC: I'm sorry, I spoke over you, but I object to the form of the question.

BY MR. MAISTROS:

Q. If you go forward two figures, you'll

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see, will you not, again, that insofar as tar, nitrogen oxides and carbon monoxide are concerned, you'll get somewhat of a correspondence in the percent change of yield as permeability increases, correct?

MR. BELASIC: Same objection.

THE WITNESS: Yes. It is true that in the case of a perforated cigarette paper, tar, oxides of nitrogen, carbon monoxide vapor follow similar reduction trend.

BY MR. MAISTROS:

Q. In fact, again in both of these two charts, the nicotine yield is reduced the least by increasing the inherent permeability or the perforation, right?

A. Would you repeat your question, please?

Q. In both of these charts as a general proposition, the percentage of change of nicotine yields is the least in terms of the relation to the other compounds, is it not?

A. No. I don't see that. In the case of inherently permeable paper, carbon monoxide and nitrous oxide are reduced to a lesser degree of nicotine up to papers of 60 CORESTA or so. In the case of perforated paper, nicotine is reduced

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the least of the constituents that were measured for this chart.

Q. Beyond 80 CORESTA nicotine yield is reduced the least inherently with permeable cigarette paper, correct?

A. Not the least, because there is a vapor phase measurement on that particular chart for the inherently permeable paper.

Q. What is in the vapor phase?

A. The vapor phase is a collection of constituents like the carbonyl compounds which include formaldehyde, acetaldehyde, aprolein, isobrein.

Q. Let's just view tar and nicotine. After the nicotine or the tar is reduced more by inherently permeable cigarette paper?

A. In this chart and in this experiment, the tar is reduced by a greater degree than the nicotine is.

Q. And in the figure five, is the nicotine or the tar reduced more by the perforated cigarette paper?

A. In figure five which shows the effect of perforated cigarette permeability, the tar is reduced to a greater degree than the nicotine is.

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Q. Have you discussed with any other Reynolds' employees your deposition in tobacco litigation?

A. No, I have not.

Q. The deposition that you reviewed of Dr. Townsend, did that contain questions and answers related to the use of Freon?

A. I think it may have had some references to Freon.

Q. In 1983, you became a senior research and development chemist?

A. Yes, I did.

Q. And were you in that position for two years until '85, December of '85?

A. Yes, I was.

Q. How did your role differ, if any, from previous years?

A. Primarily in my mind the degree of responsibility that I had. I think by the time I reached the level of senior R and D chemist, I had a few people reporting to me and the type of work I was doing didn't -- or type of research work I was doing did not differ that much from the previous year, I was still conducting research primarily on component materials that go

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into cigarettes, how to specify them, how to use them for smoke reduction purposes.

Q. What was your group called in '83 to '85?

A. I think it was still the filter materials group at that point.

Q. Was Ibister ever in your chain of authority?

A. I think I mentioned before that he was some type of technology director for the company, and in that regard, he might have been considered head of research and development as well as another department. I can't recall which one that was. So that way, yes, I was in his chain of command.

Q. Did you work on Premier?

A. Yes, I did.

Q. Beginning when?

A. I think in 1983.

Q. So as senior research and development chemist, you had a role in Premier?

A. Yes, I did.

Q. What was your role?

A. I did some work on the heat source.

Q. Who invented that heat source?

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A. I don't know who invented the heat source proper. There are a number of patents issued regarding the heat source and a number of inventors included on those patents.

Q. Including you?

A. Yes.

Q. Is that your only involvement in Premier, was working on the heat source?

A. Yes, it was.

Q. You didn't do any toxicology work?

A. No, I did not.

Q. Did you contribute to the Premier monograph?

A. No, I did not.

Q. Did you attend any briefings of either scientists, doctors, governmental types on Premier?

A. No, I did not.

Q. Did you participate in taste panels for Premier?

A. Yes, I did.

Q. How were those set up?

A. The one that I participate in, was one where they gave us a quantity of Premier cigarettes to smoke and evaluate and gave us a

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ballot, and on a weekly basis, they delivered the cigarettes and a ballot and we returned the ballot from the previous week.

Q. Are you familiar with what toxicological tests were done on Premier?

A. I know some of the toxicological tests were done on Premier, at least the names of them.

Q. Did you participate in those or you are just familiar with them?

A. I'm just familiar with them. I did not participate in the conducting of those tests.

Q. Are you familiar with the design of Premier?

A. Yes, I am.

Q. Was there reconstituted tobacco used in premium?

A. Yes. There was reconstituted tobacco used in Premier.

Q. Was there expanded tobacco used in Premier?

A. I do not believe there was any expanded tobacco used in Premier.

Q. Was there what you call non reconstituted, non expanded tobacco, just tobacco?

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A. That is fair.

Q. Was there just tobacco used in Premier?

A. I don't think there was any tobacco in Premier that wasn't processed in some manner.

Q. Was there any actual tobacco, whether it is reprocessed or not, was there any actual burning of tobacco in Premier?

A. No. One of the design objectives of Premier, was to avoid any combustion or paralysis of tobacco, and to the best of my understanding, the product performance was not such that any tobacco was burned in that product.

Q. What was the nicotine content of Premier?

A. I think the nicotine yield of Premier was on the order of .2 milligrams per cigarette.

Q. Do you know what the content was?

A. I do not know what the content of nicotine in the Premier cigarette was, no.

Q. Do you know how the nicotine yield was determined for Premier?

A. By the FTC test procedure that we talked about earlier today, wherein the cigarettes that we had smoked by the prescribed details in that

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test method and then measured on the Cambridge filter.

Q. How was it decided that the Premier cigarette would have a nicotine yield of 2 milligrams?

A. I don't know the answer to that.

Q. Was Premier tested with different levels of nicotine in it before it went out on test market?

A. I don't know.

Q. What is the primary difference between Premier and Eclipse?

A. Well, there is one by manufacturing technique and that has to do with the aluminum capsule that was in Premier, has been replaced with a roll of shredded tobacco in the Eclipse case.

Another difference between Eclipse and Premier is that some tobacco is burned in Eclipse and there is some tobacco surrounding the heat source in Eclipse, and there may or may not be some in the heat source proffer. I know they considered that. I don't know if that's in the production version.

Q. What is the nicotine yield of

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Eclipse?

A. It is on the order of .2 milligrams per cigarette.

Q. Is that considered an ultra light?

A. Well, we normally think in terms of tar yields for ultra light and I think the tar yield of Eclipse is in the ultra light category.

Q. Are there resins in Eclipse like there were in Premier that are coated with nicotine extract?

A. I don't know what you are referring to when you say resins in Premier.

Q. What form is the nicotine in Eclipse?

A. So far as I know, it is in the tobacco that's in Eclipse.

Q. What form was the nicotine in that was in Premier?

A. Again, so far as I know, the nicotine that was in Premier was in the tobacco.

Q. Are you familiar with Premier had resin pellets in it?

A. I don't know of any resin pellets that were in Premier. There were aluminum pellets in the capsule of Premier.

Q. Were those aluminum pellets coated

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with anything?
A. My understanding is the aluminum pellets had glycerine applied to them. The glycerine contained some flavorants.
Q. Did they contain nicotine?
A. To the best of my knowledge, no. If they contained nicotine, I don't know it.
Q. Would Dr. Hayes know whether nicotine extract was added to Premier?
MR. BELASIC: Object to the form. You are asking him to speculate on what some other guy knows.
MR. MAISTROS: I know.
BY MR. MAISTROS:
Q. Do you believe he should know?
MR. BELASIC: Well, that's a different question and I have a different objection. Now you are asking him if some other person should know.
THE WITNESS: I don't know whether Dr. Hayes -- or I don't know what Dr. Hayes knew about the design of Premier.
BY MR. MAISTROS:
Q. And Eclipse is on the market now?
A. Eclipse is in test market right now.

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Q. Where?
A. In Chattanooga, Tennessee. Atlanta, Georgia, and one other location that escapes me right now.
Q. Have you seen any results of those test markets?
A. I have not.
Q. And you are smoking Eclipse?
A. Yes. I smoke Eclipse.
Q. Have you been keeping track if you smoke more Eclipse than you did of your other cigarette?
A. No, I haven't.
Q. How many packs of your regular cigarettes do you smoke when you smoke them?
A. Well, Eclipse is my regular cigarette right now, and I've been smoking about a pack a day.
Q. Is that true also for what is it, Camel Ultras you smoke?
A. I smoked Camel Lights before, and I smoked about a pack a day of those.
Q. What is the nicotine yield of Camel Lights?
A. I think it is about .8 milligrams per cigarette.

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Q. In this time period of '81 to '83, I'm sorry, '83 to '85, was there a group set up specifically with respect to new products?

A. We may have had a new product group at that time. I don't recall the name of it if we had it.

Q. Was there an advanced products group?

A. There may have been an advanced product group at that time.

Q. Did you do any work on either new or advanced products, other than Premier?

A. I don't recall doing any work on new or advanced products in that time period other than Premier.

Q. Did you ever see any internal reports on why Premier did not succeed?

A. I don't remember seeing any internal reports on why Premier did not succeed in this test market.

Q. Did you ever hear any stories or beliefs as to why Premier did not succeed?

A. Yes. I've heard speculations and stories and beliefs about why Premier did not succeed.

Q. Internally at RJR?

A. Yes. Internally at RJR.

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Q. What have you heard?
A. One thing I've heard is that the cigarette didn't taste good enough for people to buy it.
Q. Anything else?
A. Another was that we pulled the cigarette off the market because of pressure from our critics.
Q. Anything else?
A. Those are the two things that I heard.
Q. Was premium advertised by Reynolds as a safer cigarette?
A. No, it was not.
Q. Was it advertised as a less addictive cigarette?
A. No, it was not.
Q. And again, in this period of '83 to '85, you were working mainly on filters material?
A. Filters and other cigarette materials, including the cigarette paper, tipping paper, plug wrap paper.
Q. Well, what type of work were you doing that actually ended up in a commercially sold cigarette?
A. Well, the type of work that I was trying to describe, and this is the nature of applied R and

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D, we want to understand how to better specify the materials that go into our cigarettes for the functional components. In that regard, the work that I was doing ended up in commercial practice, even if I wasn't trying to invent some new material for use in cigarettes, so the point here is, during this time period we're learning to use the on line lazar, for example, figuring out how to set specifications for the machinery in order to produce a particular filter ventilation level, so that sort of result ended up in commercial practice with regard to specifications for cigarettes.

Q. From '85 to '88, you were senior staff R and D chemist?

A. Yes, I was.

Q. Did anything change in terms of your roles?

A. Again, the major distinction between that title and the senior R and D chemist is, expectation of my supervisors that I was going to leave research instead of conducting research so I had some responsibility for people reporting to me and taking on somewhat more of a planning role and somewhat less of an active role in the

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laboratory.

Q. Did you have to develop goals for the people working under you as a senior staff R and D chemist?

A. I think at that time I probably sat down with people reporting to me and working with me and helped them with their research goals, yes.

Q. Are you familiar in this time period with what I referred to as key issues?

A. Yes. I think during that time period and maybe even before and after we had planning documents that talked about key issues.

Q. What are some of the key issues that you can recall?

A. I'm not sure I can recall any key issues from that time point.

Q. Did your specific research projects have to be tied to a key issue?

A. I think the intent was that research project would be tied to some level of key issues and that was so that managers could track activities against what they considered important.

Q. Who developed the key issues at Reynolds?

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A. Again, I don't know. I don't recall specific key issues, and unless I could do that, I'm not sure I could link those with an individual that might have suggested them.

Q. Do you think increasing the sale of cigarettes would have been a key issue?

A. Well, it is always an important issue for this company. We're in the business of selling cigarettes, but with R and D in mind, our key issues would be formulated in a different way. I mean, we would be trying to do something that would enable us to sell more cigarettes, for example, but that wouldn't be a key issue, I don't think.

Q. Well, research and development had as one of its goals, was it not, to sell more cigarettes?

A. I've never seen that held up as a goal for researchers to go and work in the lab to try to do, and again, in our company our business is selling cigarettes and we like to sell more of them and we would like to have R and D's activities tied to that goal.

Q. Was one of the key issues reducing the criticisms from non smokers?

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A. I don't recall a key issue being written that way. We have done work on cigarette designs, for example, that seek to reduce the amount of secondhand smoke emitted, and in that way, it would be linked to an issue like what you are suggesting. I'm just not sure it was ever worded that way.

Q. Were you reviewed by somebody at Reynolds every year?

A. I had a performance evaluation every year, yes.

Q. Have you ever received an unsatisfactory review?

A. No, I have not.

Q. Have you ever been demoted?

A. No, I have not.

Q. Has anyone ever leveled any complaints against you of any nature while you were employed at Reynolds?

A. I can't think of one, no.

Q. Who is currently reviewing you?

A. My immediate supervisor, who is Leslie Lewis.

Q. Is that a man?

A. No. Leslie Lewis is a woman.

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Q. Her title is what?
A. Master scientist.
Q. What is above master scientist?
A. Principle scientist.
Q. Is that something you have to apply for?
A. No.
Q. Who decides if you become a principle scientist?
A. Well, master scientist and principle scientist and there is one other position called senior principle scientist, are all on our, what we call technical advancement ladder, and the way those promotions are awarded is, typically one supervisor or someone that a person works closely with will write a nomination document that is submitted to a committee that reviews the qualifications of the candidate against the criteria for the positions. If the committee decides that the qualifications and criteria are a good match, they'll recommend to management that the candidate is promoted to that position.
That's distinctly different from our management ladder, in which case promotions are awarded based on the need for a management person

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in a particular function.

Q. And have you ever been nominated for principle scientist?

A. I don't know.

Q. Now it says on your resume that you were a master scientist from July of '88 to the present, but I'm interested in July of '88 to July of '90, and then July of '90 to November of '92. During those four years you were working with sidestream yields?

A. Yes.

Q. And you distinguish between low sidestream yields and reduced sidestream yields. Why that demarcation?

A. Well, I don't know. Maybe what I was trying to do was have more diversity in my sentences. When I talk about reducing sidestream yields and having a cigarette with low sidestream yields, it is much the same thing.

Q. In that four year period, what percentage of your time was devoted to sidestream smoke?

A. I don't recall exactly. It was the better part of my time.

Q. What else were you working on in that

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four year period?
A. I don't remember.
Q. Did you do any work on nicotine during that four year period?
A. I do not think so, no.
Q. Did you work on filters?
A. We may have had some work going on in this '88 to '90 time period in my lab on filters.
Q. Were there any commercially sold products that you worked on that arose out of your work?
A. In which time period?
Q. '88 to '90, on sidestream smoke.
A. Ultimately, our low sidestream product that was on sale in Japan came out of this work.
Q. Is that Pianissimo?
A. Yes.
Q. Why is that marketed only in Japan?
A. The best we could do in this country was not consumer acceptable, but Japanese smokers like that cigarette.
Q. What is the main component that reduces sidestream smoke in Pianissimo?
A. It is a special double wrap cigarette paper.

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MR. MAISTROS: Let's go off the record.

(DEPOSITION ADJOURNED AT 4:00 P.M.)

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C E R T F I C A T E

I, Alan Norman, do hereby certify that I have read and understand the foregoing transcript and believe it to be a true, accurate, and complete transcript of my testimony, subject to the attached list of changes, if any.

Alan Norman

This deposition was signed in my presence by Alan Norman on the _____ day of _____, 1997.

Notary Public

My Commission Expires:

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State of North Carolina
County of Forsyth

REPORTER'S CERTIFICATE

I, Jane F. Allen, a Notary Public in and for the State of North Carolina, do hereby certify that there came before me on Tuesday, November 18, 1997, the person hereinbefore named, who was by me duly sworn to testify to the truth and nothing but the truth of his knowledge concerning the matters in controversy in this cause; that the witness was thereupon examined under oath, the examination reduced to typewriting under my direction, and the deposition is a true record of the testimony given by the witness.

I further certify that I am neither attorney or counsel for, nor related to or employed by, any attorney or counsel employed by the parties hereto or financially interested in the action.

IN WITNESS WHEREOF, I have hereto set my hand and affixed my official notarial seal, this the 24th day of November 1997.

Jane F. Allen

Jane F. Allen, Notary Public
My Commission Expires 10/26/02

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SUPREME COURT OF THE STATE OF NEW YORK
COUNTY OF NEW YORK

INDEX NO. 110951/96
Judge Charles E. Ramos

MARY ANN HOSKINS, Executrix of the Estate of Edwin Paul Hoskins, WALTINA BROWN and DANTE AUBAIN, individually and on behalf of others similarly situated,

Plaintiffs,

vs.

R.J. REYNOLDS TOBACCO COMPANY, RJR NABISCO, INC., COUNCIL FOR TOBACCO RESEARCH-USA, INC., (Successor to Tobacco Industry Research Committee), AND TOBACCO INSTITUTE, INC.,

Defendants.

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Deposition
of
ALAN NORMAN (Volume II)

TRANSCRIPT of testimony as taken by and before Jane F. Allen, a Notary Public of the State of North Carolina, at the offices of Bell, Davis and Pitt, 635 West Fourth Street, Winston-Salem, North Carolina, on Wednesday, November 19, 1997, commencing at 9:40 a.m. the

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- A P P E A R A N C E S -

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THEREUPON:

MR. BELASIC: The witness wants to clarify something that he testified to yesterday, if you don't mind.

MR. MAISTROS: We'll get into that.

BY MR. MAISTROS:

Q. Mr. Norman, I'll remind you that you are still under oath, okay?

A. Okay.

Q. In between yesterday and today, did you discuss any of your testimony with any attorneys for Reynolds?

A. Yes. We had some discussions after the end of the session yesterday, Mark, and I did.

Q. What topics did you discuss?

MR. BELASIC: Objection. It is attorney/client privilege.

MR. MAISTROS: The topics you discussed?

BY MR. MAISTROS:

Q. You discussed portions of your testimony yesterday. I don't want to hear what they were. Did you discuss your testimony yesterday?

A. Yes.

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Q. Did you discuss some of the answers you gave yesterday?

A. I don't recall discussing any specific answers.

MR. BELASIC: We're not going any further into discussions between Mr. Norman and his counsel. As an expert you are entitled to determine what he relied upon for his report and for his opinions, that's it.

BY MR. MAISTROS:

Q. What do you want to correct from yesterday's testimony, now that you talked to your attorney?

A. Yesterday you asked me a question to the effect had I ever been criticized, and you gave a rather broad definition of criticism, and I believe my answer was no, and I should have said well, yes, I have been criticized, given your broad definition of criticism.

Q. In what fashion?

A. Well, my first thought was constructive criticism, for example, and I write reports as part of my job, and people review my reports and make suggestions about ways I can improve the clarity of my writing. That's just one example.

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But I didn't mean to imply that I've never been criticized in any way, shape or form.

Q. Is that it?

A. Yes, it is.

Q. Yesterday we talked a little bit about top coatings, top dressings, do you remember that?

A. Yes.

Q. Did you make a distinction between top dressings and top coatings?

A. The term that I heard regularly is top dressing. I'm not aware of top coating.

Q. What is a top dressing?

A. A top dressing is a flavoring application to the cut filler of tobacco.

Q. When you say cut filler, does this mean right before the tobacco goes into the cigarette?

A. Yes.

Q. So it is a combination of expanded, reconstituted and blended non processed tobacco?

A. Yes.

Q. Is that the only point in time top dressings are put on tobacco?

A. There may be other top dressing

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applications prior to the combination of all the tobaccos that comprise the finished cut filler.

Q. You don't know?

A. I don't know.

Q. So you are not familiar with the application of top dressings in the entire manufacturing process?

A. No, I'm not.

Q. So you could not testify with any reasonable degree of scientific certainty concerning the effect of top dressings and cigarettes?

A. No, I can't.

Q. Let's talk about casings a moment. What are casings?

A. A casing is another flavoring application that is usually heavier than a top dressing. Casings normally apply to the strip tobacco prior to being cut to form the cut filler.

Q. Now, when you say the strip tobacco, is that unprocessed tobacco?

A. Well, most of the strip tobacco is unprocessed tobacco, although reconstituted tobacco is combined with strip tobaccos in our processing prior to cutting.

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Q. What is the difference between casings and top dressings, other than the weight or --

A. The constituents of the casing are different than the top dressing.

Q. What role do the casings play?

A. Well, one role the casings play is the humectant, and it conditions the tobacco for the cutting process. And again, the flavorants that we apply in the casing are different. Casing normally contains in addition to humectants which might be glycerine or water, it contains some cocoa, licorice and sugar.

Q. What effect do those compounds have on the nicotine yields of the cigarettes?

A. I don't know what effect they have on the nicotine yield of the cigarette, other than a small dilution effect, and what I mean by that is, if we apply X percent casing to the cigarette, we displace some weight of the tobacco, so you could say that the casing application reduces the nicotine content of the entire cigarette.

Q. I'm specifically focusing on nicotine yields. Do you know what effect those casing

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materials have on nicotine yields?
A. No.
Q. You could not testify with any degree of scientific certainty with respect to the issues of what those casings effect is if any on nicotine yield?
A. I have not studied the effect of casing on nicotine yield, no.
Q. That would include humectants. You could not testify as to the effect of the humectants on nicotine yield?
A. I don't recall any studies demonstrating effects of humectant on nicotine yield.
Q. I believe yesterday you testified, just confirm this, you could not offer an opinion within a reasonable degree of scientific certainty concerning the role if any played by the selection of different blends of tobacco in nicotine yields?
A. I don't recall my testimony from yesterday on that. I believe what I may have said about selection of tobaccos to go into a tobacco blend were that different tobaccos contained different amounts of nicotine. There is quite a bit of variability coming from the agricultural side of

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tobacco growing where the tobacco is grown, the type of tobacco, the grade, and the blending process that we use, we attempt to maintain the same quality of tobacco. The amount of nicotine in the tobacco has a bearing on the nicotine yield of the smoke.

Q. I understand you have a general understanding of it, but could you offer an opinion with a reasonable degree of scientific certainty concerning the blending process?

MR. BELASIC: Object to the form. What opinion about what in the blending process? Just anything?

BY MR. MAISTROS:

Q. Any opinion. We'll start there.

A. Well, I think I just gave one opinion about the effect of blending on nicotine yields.

Q. Do you know what the different nicotine contents are in the different types of tobacco?

A. No, I do not.

Q. Do you know what the nicotine yields are of the different types of tobacco?

A. No, I do not.

Q. Do you know what effect fertilizers

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have on the nicotine contents or yields of any particular type of tobacco?

A. I know that in general, the type of fertilizer used in an amount can have an effect on nicotine content in the tobacco, but in specific terms, I do not know.

Q. Do you know what effect the dry weather has on nicotine content and yields of tobacco that is grown in that dry weather?

A. I know that in general, climate can have an effect on nicotine content of tobacco, but I don't know the specific relationships.

Q. Do you know after reviewing documents yesterday, how many different types of reconstituted tobacco Reynolds has utilized in the last 20 years?

A. I don't know in the last 20 years, no.

Q. Do you know how many different types of expanded tobacco Reynolds has utilized in the last 20 years?

A. No. I don't know how many types we've used in the last 20 years.

Q. Do you know what flavorant Reynolds has utilized in the last 20 years?

A. No, I do not know what flavorants were used

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in the last 20 years.

Q. Could you offer an opinion to a reasonable degree of scientific certainty, as to why Reynolds uses ammonia in its tobacco manufacturing processes?

A. Yes. And, I believe I mentioned yesterday, that as far as I know, we use ammonia in our process for two reasons; one is for strengthening the sheet of the reconstituted tobacco. The other one is for flavor purposes.

Q. Would that be the same answer for diammonium phosphate?

A. As far as I know, the diammonium phosphate is used for strength improvement in the what we call the webb or the base sheet.

Q. So neither of those two compounds, in your opinion, have anything to do with the PH of the smoke?

A. Well, yesterday I think I explained that PH of the smoke is a measurement that is really the PH of the solution with smoke dissolved in it. If by some process you manage to increase the ammonia content of the smoke enough, the PH as measured the way I just described, might go up.

Q. Okay.

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A. So there could be a relationship between the amount of ammonia that you use in processed tobacco and the smoke PH as measured.

Q. But it is your testimony, within a reasonable degree of scientific certainty, that the Reynolds Tobacco Company doesn't use either ammonia or DAP for the intended or effective purpose of effecting PH?

A. Yes. It is my opinion that we do not use ammonia to change the PH of smoke. In fact, when I've reviewed smoke PH measurements and smoke PH measured by the way I described a moment ago, over a period of time from the 1950's through the 1980's or 1990's, what I see in smoke PH measurements of Winston King size cigarettes, for example, is what I would term essentially random variations in the numbers measured periodically over those time periods.

To me that indicates that whatever process we used in that particular cigarette during that period of time, did not result in any systematic change in the smoke PH.

Q. It is your testimony based upon a reasonable degree of scientific certainty, that Reynolds didn't use ammonia or DAP for the

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purpose of effecting nicotine yields or transfer rates?

A. It is my opinion, that we do not use ammonia or DAP to effect nicotine yields in the smoke, and I remember yesterday you defined transfer rate in a particular way, which I can't comment on one way or the other, because your transfer rate definition included some biological function.

Q. You understand transfer rate then to be the process that nicotine goes from a compound to a vapor?

A. No, sir. What we normally term transfer efficiency is the word we use for it, for nicotine or other constituents in the smoke, we take the smoke yield of the constituent divided it by the content of that constituent in the tobacco, so for -- when we talk about nicotine transfer efficiency, the total number of milligrams in the tobacco rod of nicotine divided into the smoke yield of nicotine for that particular cigarette.

Q. It is your testimony within a reasonable degree of scientific certainty, that Reynolds does not use ammonia or DAP for the

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purpose of effecting the transfer efficiency of nicotine?

A. Within the definition that I just gave you for transfer of nicotine from tobacco, I don't believe that we use ammonia or DAP to effect that statistic.

Q. And the other transfer notion that you may have talked about yesterday, that is how nicotine passes through the body, you have no familiarity with?

A. No, I don't. I'm not an expert in physiology or biology.

Q. Did you participate in any fashion in the gathering of documents that were provided to the FDA in response to the FDA's request of Reynolds to produce all documents relating to any work it had done on nicotine when the FDA was considering regulating nicotine in 1994?

A. I don't recall participating in any document gathering in that time period.

Q. Did you or have you ever had any role in the production or creation of a list of ingredients used in tobacco and cigarette manufacturing process?

A. I don't recall being asked to assist with

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any preparation of such a list, no.

Q. In your work on the Premier project, were you familiar with any concern that anyone raised with respect to whether or not a substitute for nicotine should be used in Premier due to cardiovascular effects related to nicotine?

MR. BELASIC: Objection, no foundation. You can answer.

THE WITNESS: I don't recall any discussions along those lines, no.

BY MR. MAISTROS:

Q. Do you recall any discussions concerning cardiovascular effects relating to nicotine during the production of Premier?

A. No. I don't recall any discussions of cardiovascular effects of nicotine in Premier. And again, my work in Premier was related to the heat source.

Q. Are you familiar with adverse effects related to nicotine?

MR. BELASIC: Now we're way outside the scope of his expert report. His expert report doesn't go to whether or not nicotine causes cardiovascular disease. He's certainly

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not going to be offered, moreover in the Hoskins case, the complaint itself doesn't contain any claims that relate to whether nicotine causes cardiovascular disease, it is not only --

BY MR. MAISTROS:

Q. He says in his report, Mark, in Paragraph 5, that Reynolds was instrumental in developing a new cigarette design techniques, including more effective filtration, porous paper, air dilution, reconstituted tobacco and expanded tobacco, that made possible the marketing of cigarettes which were responsive both to various criticisms of the scientific and medical community and to the demands of smokers and which were in conformity with the generally recognized state of the art for a consumer acceptable product.

Now is it your testimony that nicotine doesn't fall within any of those categories?

I'll move on. Did Reynolds not make any efforts to reduce nicotine in response to demands of either the scientific or medical community?

MR. BELASIC: Objection that

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misstates his testimony. My point is, that nicotine relationship with cardiovascular disease or any disease is irrelevant in the Hoskin case and outside the scope of his report. You can answer.

THE WITNESS: Could you repeat your question, please?

BY MR. MAISTROS:

Q. Are you familiar with any adverse health effects related to nicotine? Different question.

A. Well, the adverse health effects of smoking, whether related to nicotine or not, is not something that I'm an expert in. I've done some reading in the area and I've read some reports that discuss potential effects of nicotine, and my reading of it is the consensus view in the health community is that nicotine per se, is not that big of a risk factor.

Q. Now, you say in your report, that Reynolds developed cigarettes in response to scientific and medical demands to reduce certain compounds, et cetera.

Specifically, what are you offering expert testimony on that Reynolds did to respond

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to scientific and medical demands or criticisms?
A. Well, first of all, if you are referring to my Paragraph 3 of my expert report, I think the sentence reads that Reynolds --
Q. Paragraph 5.
A. Paragraph 5, excuse me. Okay. I see the word medical community. What we've done over the years is reduce yields of cigarettes, and by virtue of use of filtration, ventilation, higher porosity papers, expanded tobacco, reconstituted tobacco and in that way we reduced yields of both nicotine and tar in our cigarettes.
Q. Have you reduced tar since 1985?
A. For a specific cigarette brand we may have reduced the tar yield. What we've done since the early 80's, is proliferate ultra low tar products, and at this time we offer a range of cigarettes with tar yields covering a broad range and the nicotine yields follow the tar yields.
Q. Do you know if the sales weighted average of RJR cigarettes since 1980, show a reduction in tar or nicotine levels?
A. Well, I recall some discussion of that yesterday and we referred to a figure that is in my CORESTA monograph contribution, and our

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discussion from yesterday, I think focused on the fact that relative to prior years, the sales weighted average numbers for tar and nicotine are fairly flat, and I believe the reason for that flat curve is market mix. We offer cigarettes ranging from about one milligram tar and .1 milligram nicotine or below, up to higher yield cigarettes like unfiltered products that have about 20 milligrams tar and about 1.3 milligrams nicotine.

One of the reasons that curve is flat is, that it is not because we haven't offered cigarettes of a wide range of yields, it is because the mix of sales of those products.

Q. You are not a marketing expert, are you?

A. No, I'm not.

Q. Do you know if the sales weighted average of Reynolds cigarettes have shown any decrease in either tar or nicotine since 1985?

A. Well, as I said before, the sales weighted tar and nicotine numbers for the industry, which is what I'm more familiar with than R.J. Reynolds sales weighted average, has been relatively flat since 1980.

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Q. So tar and nicotine levels of the product of sales weighted averages have not decreased in the industry since 1980?

A. Well, when I say the curve has been flat, that means that it hasn't decreased and, again, the sales weighted average is comprised of the yields of the cigarettes sold, multiplied by the market share of each brand, and that reflects a market mix and not the range of products that are available.

Q. Has Reynolds ever attempted to develop a smoking cessation device?

A. I'm not aware of any developments that Reynolds has made towards a smoking cessation device.

Q. Do you know what Project Omega is?

A. I recall the name of the project. I'm not certain what the development centered around.

Q. Do you know what the J10 process is?

A. I recall the name J10, but I don't remember the specific material that is being developed there.

Q. Do you know what the M2000 process is?

A. No, I do not.

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Q. Did you work at all on Winston No Bull?

A. No, I did not.

Q. Do you know anything about Winston No Bulls?

A. What I know about Winston No Bulls is a cigarette with no additives applied to the tobacco.

Q. Including no ammonia?

A. So far as I know, there is no ammonia added to it.

Q. And no diammonium phosphate?

A. As far as I know, there is no diammonium phosphate added to it.

Q. EW was a cigarette you talked about a little bit yesterday that was test marketed?

A. Yes.

Q. Was that a brand family?

A. Well, EW is the internal name for the project. The test market cigarette was called Winston Select, and I believe there were six different styles of Winston Select with the EW ideas invited in it.

Q. And it had a carbon paper filter?

A. Yes. One of the filter elements was

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cellulose acetate. The other filter element was a paper that had charcoal embedded in the paper.

Q. Was that a cigarette that was test marketed for the purpose of responding to scientific and medical criticisms of cigarettes?

A. In my opinion it was, yes.

Q. And what was the response, I mean, what was the purpose of the Winston Select project EW?

A. The purpose of the EW project, was to design and develop a cigarette that reduce yield of what we call controversial compounds and these are compounds that our critics have identified as ones that may have health significance.

Q. What compounds about EW reduce --

A. As a class, the carbonyl compounds in the vapor phase of smoke, and that's part of the reason for having the charcoal filter element in place.

Q. And is this one of the cigarettes you are prepared to testify as an expert that was introduced in response to the criticisms of the scientific and medical community?

A. Yes. In my opinion, that cigarette was developed as a response to criticisms from

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outside of our business.

Q. And it is your belief that that cigarette was taken off the market because of lack of consumer acceptance of taste?

A. In my opinion, the reason it was taken out of the test market is because it did not achieve consumer acceptance.

Q. It had nothing to do with the introduction of Winston No Bull?

A. Not to my knowledge, no.

Q. Who would know more about why the Winston Select project EW was taken off the market, you or David Townsend?

A. Probably David Townsend would know more. It was his work directly connected with it, he was more directly connected with the project than I was.

Q. What other designs, specifically designed cigarettes has Reynolds marketed to respond to scientific and medical criticisms?

A. Well, recently, Premier is a product that I believe was designed to address criticisms of cigarettes. Eclipse is another cigarette that I think was designed to address criticisms.

Q. Do you know how the nicotine transfer

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efficiency of Premier compared to a typical Reynolds cigarette?

A. No, I do not.

Q. Do you know how the nicotine transfer efficiency of Eclipse compared to a typical Reynolds cigarette?

A. No, I do not. What I do know is that the yields of both Eclipse and Premier of nicotine in the smoke, were similar to ultra light products that we sell.

Q. Do you know how the carbon monoxide levels of Premier compared to typical Reynolds cigarettes?

A. I think that carbon monoxide yields of Premier were in the range of the higher tar ultra light products that we sell or the lower end of light products that we sell.

Q. How about Eclipse?

A. I don't recall seeing any carbon monoxide numbers recently for Eclipse.

Q. Premier was introduced when?

A. 1988, I believe.

Q. And Eclipse was introduced when?

A. This year.

Q. Any other specific cigarettes that

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were marketed by Reynolds to respond to scientific and medical criticisms?

A. Well, I think that in a sense, our developments in low tar cigarettes have been in response to scientific reasons, and that could comprise a lengthy list of product introductions over the years.

Q. Can you think of any other specific cigarettes as opposed to a general category of low tar cigarettes that were introduced by Reynolds in response to medical and scientific criticisms?

A. One that I believe was introduced in the 60's was Tempo, and this was a cigarette with a charcoal filter included in it, and that cigarette, I think we talked about Tempo a bit yesterday, but the purpose of the charcoal filter was to reduce the yields of carbonyl compounds as a class.

Q. How long was that cigarette on the market?

A. I believe that it was sold between 1964 and 1980.

Q. Do you know what percentage of market Eclipse has?

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A. No, I do not. Eclipse is in test market in three locations right now.

Q. Was either EW, Premier or Eclipse ever sold commercially, that is other than in test markets?

A. No.

Q. Has Reynolds over sold commercially a cigarette with no nicotine?

A. We had a product in the mid 70's, around 1976 or '77, that was manufactured and sold in Germany that had very low nicotine content of the tobacco.

Q. What was that called?

A. I think Reynolds Number One was the name of it, or there may have been a product called Pro that was a similar idea.

Q. Was that product ever sold in this country?

A. Not to my knowledge.

Q. How did Reynolds remove the nicotine from the tobacco?

A. I don't know what process was used.

Q. Is Reynolds currently studying ways to market and sell a no or denicotized cigarette?

A. I'm not aware of any work at present on

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lower, no nicotine tobacco contents.

Q. Are you aware if the scientific or medical community has criticized tobacco manufacturers such as Reynolds for selling cigarettes that contain nicotine or too high of levels of nicotine?

A. I'm aware of some criticisms of the tobacco industry for selling cigarettes that have too high nicotine content, yes.

Q. What has Reynolds done to respond to those criticisms?

A. I'm not aware of any particular response to those criticisms, other than the fact that we already at the time of those criticisms, are selling cigarettes with a range of smoke yields in nicotine.

Q. And that range, I think you testified, went from, was it .5 up to 1.2?

A. My recollection is, that our cigarettes range from about 1.3 milligrams of nicotine down to .1 milligrams or less.

Q. Or .1. What cigarette is that?

A. That would be NOW.

Q. If you took the sales weighted average of all of Reynolds' cigarettes and

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compared it to the nicotine contents, where do you believe the sales weighted average would fall in terms of .1 to 1.3, your most popular brands, is there an average nicotine level that you can identify?

A. I'm not familiar with how R.J. Reynolds brands only would trend on sales weighted numbers. I mean, when I've looked at sales weighted numbers, it has been on an industry basis, not a company basis.

Q. Do you know what the sales weighted numbers for the industry would be in terms of most popular cigarettes versus least popular cigarettes?

A. I'm not sure I understand your question.

Q. Let's take a range of .1, do you know what the industry range is for nicotine?

A. I don't know exactly, but I would think it is similar to what it is for R.J. Reynolds product. I mean, there could be some variation at the high end around 1.2 or 1.3 figure that I quoted before.

Q. Do you know what the industry's best selling cigarette is in terms of nicotine content?

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A. The industry best selling cigarette is Marlboro, I think the box product is the most popular cigarette.

Q. What is the nicotine content of Marlboro?

A. It is in the range of 1.1 or 1.2 milligrams, I think. I'm not certain.

Q. What is the second most popular cigarette in the industry?

A. Another one of the Marlboro products.

Q. What is the nicotine range of that product?

A. Again, I would have to go look at some sales figures to know which style it is, and I don't know whether the second most popular cigarette is their light product or one of their full flavor products, so I don't know.

Q. Do you know or could you offer an opinion in terms of sales weighted average, what the nicotine content is of the best selling cigarettes in the industry?

A. When you say nicotine content, you mean the concentration of nicotine in tobacco or do you mean the smoke yield?

Q. Smoke yield, I'm sorry.

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A. Could you repeat your question, please?

Q. Sure. Do you know, are you familiar with sales weighted charts showing smoke yields of cigarettes based upon -- I'm sorry, nicotine yields of cigarettes, are you just familiar with the concept? Are we missing each other here?

A. I think so.

Q. Cigarettes have a nicotine yield range and I think I used content before, I apologize, of .1 to 1.3 in the Reynolds' cigarettes, correct?

A. About, yes.

Q. That you believe would be true for the industry?

A. Close to that range. There could be some variation around that.

Q. Have you ever seen any statistics or charts that would indicate what the nicotine yield is of the best selling cigarettes either in the industry or at Reynolds?

A. Well, within the industry the best selling cigarette is one of the Marlboro styles, and I said I think when you bring it down to a specific style it is the Marlboro box full flavor product, and that product would be on the order of 1.1 or

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1.2 milligrams of nicotine per cigarette smoke yield.

Our best selling cigarette is one of the Doral Light products, and if my memory serves, the nicotine yield of our best selling cigarette is going to be on the order of .8 milligrams nicotine.

Q. Are you familiar with smoking studies that were done by Reynolds that suggested there was no compensation that we talked about yesterday, smoking compensation, no smoking compensation which occurred when cigarettes had a nicotine yield of .8 or above?

A. I don't recall seeing that study, no.

Q. Are you aware of any smoking compensation studies where the level of the nicotine yields was measured in terms of trying to determine if there was a certain level that had to be achieved or could be achieved that would reduce or eliminate smoking compensation?

A. I don't recall any studies showing level of nicotine from or yield of nicotine from cigarettes in the smoke versus degree of compensation or lack of compensation, no.

Q. Are you familiar with the statements

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Reynolds made to the FDA and or Congress in 1994, when the FDA was considering regulating nicotine?

A. I think I mentioned yesterday, that I was involved in writing a draft for purposes of responding to the FDA's premises on regulating nicotine, but that's the only involvement I've had in that.

Q. Were you aware when Reynolds had employees testify before Congress concerning the addictive qualities of nicotine or the allegations concerning that?

A. I don't recall that, no.

Q. You did not participate in any fashion in the preparation of statements that were read by Reynolds' employees to Congress?

A. Not that I'm aware of, no.

Q. As a chemist at Reynolds were you ever involved in any research or studies to determine the toxicity levels of nicotine?

A. No. I've never been involved in any studies regarding toxicity of nicotine.

Q. If you could look at -- do you still have the exhibits in front of you, Exhibit 3, your report. In the second paragraph you state in the second sentence, I intend to testify on

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the subject of cigarette design, the reduction in tar and nicotine levels in cigarettes during the past several decades and the obstacles encountered and successes achieved in those reduction efforts. I am also prepared to comment on the opinions in this area expressed by others in this case.

Now specifically, what are you going to testify about in terms of reduction in tar in the past several decades, and do you mean by that 20 years?

A. Yes. And before that.

Q. How far back can you testify?

A. Well, I read, and I'm aware of efforts that our research and development department undertook prior to the time I came at Reynolds from discussions of people who worked here before me as well as reading reports in our library, so I'm prepared to comment on our efforts in filters ventilation, cigarette papers use of expanded tobacco, all of which result in tar and nicotine yield reductions.

Q. You mentioned filter ventilation, cigarette paper and expanded tobacco. Is there anything else that Reynolds employed to reduce

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tar and nicotine levels?

A. Yes.

Q. What?

A. Change in the dimensions of the cigarette, and in particular, length of tobacco rods, circumference of the tobacco rod, both of which result in tobacco weight reductions, and in turn results in lower yield of tar and nicotine.

Q. Anything else?

A. Another thing we talked about yesterday a bit was treatment of cigarette papers with additives that moderate the burn rate of the finished cigarette, and to the extent that we use alkaline metal citrates to increase the burn rate of cigarettes, that can reduce the tar and nicotine yields as well.

Q. Anything else?

A. Not that I can think of right now.

Q. When did Reynolds first develop filters?

A. In the early 1950's.

Q. What filter changes has Reynolds made in the last 20 years to reduce tar and nicotine levels?

A. In the last 20 years we've worked with

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different tow items and we referred to tow items yesterday. I think we may have defined denier per filament and total denier, we work with different shaped fibers and when we change from round fibers to irregular shape fibers like Y shaped or I shaped fibers, we increase the efficiency of the filters.

We've increased the length of filters periodically in the past 20 years, all of which result in more efficient filters and reduce tar and nicotine yields.

Q. How long has Reynolds had the capabilities, as far as filter technology is concerned, to reduce the nicotine yields of all of its cigarettes to less than .5 milligrams?

A. Well, I would say that in a sense, since fairly efficient filters were developed in the early 60's, it was technically feasible to reduce the tar and nicotine yields of cigarettes to very low levels. You could theoretically have an 80 percent or 90 percent or even 100 percent efficient filter, but such a cigarette is unlikely to be consumer acceptable in any way, because if you make a very, very high efficiency filter, the cigarette would be rendered very

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difficult to draw, and if there is -- since smoke is particulates and gas phase, if you go to high in filter efficiency, you create this imbalance between the two phases of smoke, and you get a very unpalatable cigarette that wouldn't be consumer acceptable, so my answer to your question is, we had the capability to make very, very high efficiency filters for quite awhile, but in order to get cigarettes with smoke yields of nicotine below about .5 milligrams, we needed another means to do that, and that is ventilation, using ventilation in combination with filtration provides a good balance between the gas phase and particulate part of smoking of the cigarettes rendered palatable.

Q. How long has Reynolds had the ability through filtration and ventilation to produce cigarettes with a nicotine yield of less than .5 milligrams?

A. I believe that in the mid 70's we introduced now cigarettes, and when we introduced that cigarette, it was about one milligram tar and about .1 milligram of nicotine.

Q. So since the mid 70's Reynolds has had the capability to reduce cigarettes with .1

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milligram nicotine yields?
A. I believe that's correct, yes.
Q. That have been sold commercially?
A. Yes. I believe NOW cigarettes started selling commercially about the mid 1970's.
Q. Have there been any changes in either filter design or materials used that have resulted in decreases in tar and nicotine since 1980?
A. I would say probably not, and what we've done since the 80's, again, is created line extensions within brand families using materials that were developed prior to that time to manufacture cigarettes in the ultra low tar category, and the primary developments that I am aware of anyway in materials, have been refinements that enable us to use the material more effectively.
MR. MAISTROS: Let's go off the record a minute.
(OFF THE RECORD)
BY MR. MAISTROS:
Q. Let me ask you a couple of areas so I can determine if you are or are not going to be an expert in these areas, okay?

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A. All right.

Q. We've talked generally about nicotine as it is metabolized in the body, but I want to ask you if you have any knowledge of any means or processes that Reynolds employed in its cigarette manufacturing facilities, that had the purpose or effect of altering the manner in which nicotine reacted with the body?

A. I'm not aware of anything that we could do in our manufacturing process that would alter the effect of nicotine in the body, no.

Q. And you are familiar with every aspect of the manufacturing process?

A. I'm not familiar with every aspect of the manufacturing process. I have a general awareness of how we manufacture cigarettes, and in some cases a specific awareness of how we manufacture cigarettes.

Q. But you don't know, for example, the effect of chemical reactions between nicotine and any of the additives that are used?

A. No. I don't have specific knowledge of any reactions between ingredients in a cigarette and constituents of tobacco, for example. I testified yesterday about one of our uses of

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ammonia as to facilitate flavor reactions. That's a hypothesis that we've held experimentally and we're doing work in the research department that that kind of chemistry goes on, for example, but I don't have a specific understanding of exactly what chemical reactions may or may not occur in the finished tobacco after we process it.

Q. Are you aware of what effect if any moisture has on nicotine yields?

A. I'm aware of effects of moisture on how tobacco rods smolder and burn, and to the extent that you change how the tobacco rod smolders and burns, you can change nicotine yields by virtue of state of moisture of the tobacco.

Q. Could you offer an opinion with a reasonable degree of scientific certainty, as to the cause effect relationship between moisture and nicotine yields?

A. I believe I may be able to, yes.

Q. Do humectants add moisture to tobacco?

A. In a literal sense, no, I don't believe so, because to the extent that we use say glycerine as a humectant, when we add glycerine, it's not

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adding water, and moisture is normally thought of as water.

Q. What does Reynolds do to regulate the moisture content of its tobacco?

A. The tobacco in its various forms, whether processed or unprocessed, goes through a number of steps during processing where it is moisturized and dried to different levels and what we try to do is maintain the final blend moisture at a set level after all of these moisturizing and drying steps and typically our tobaccos are made into cigarettes at about 12 and a half percent or 12 percent in that range moisture content.

Q. Has Reynolds undertaken studies to determine the effect that moisture has on nicotine yields?

A. I am aware of some work on the effect of low moisture cigarettes versus higher moisture cigarettes and the yield of nicotine in the smoke.

Q. Why did Reynolds do those studies?

A. As best as I can recall, we were studying what we call dry cigarettes or low moisture cigarettes, because dry cigarettes can be a

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quality problem and this comes about because despite our best efforts to package the cigarettes properly, they can lose moisture on the store shelves, and when we have low moisture cigarettes, consumers report sometimes that they are harsh tasting, so we've studied several aspects of performance of dry cigarettes.

Q. Why did you study nicotine in response to those complaints?

A. Well, nicotine is a fairly good size component of cigarette smoke, and it is thought to be or play some role in harshness as reported by consumers.

Q. Do you know what the taste of nicotine is in a sensory sense?

A. No, I do not.

Q. You don't know whether it is bitter, sweet or neutral?

A. No, I do not.

Q. Do you know if Reynolds adds flavorants or top dressings or casings to maximize the taste of nicotine?

A. No. My understanding of the purpose for adding flavors to tobacco is to improve the taste of the cigarette smoke.

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Q. It has nothing to do with the nicotine?

A. Again, my understanding of our use of top dressings, casings, flavorants in tobacco, is to improve the taste of the cigarette smoke.

Q. Have you heard the phrase used by Reynolds of smokers satisfaction?

A. I've heard the term satisfaction used in relation to consumer responses from cigarettes, yes.

Q. Do you have an understanding of what that word means in the Reynolds nomenclature?

A. So far as I know, it is a term that we use from time to time in panel testing and it may be a term that is used in our normal consumer testing, and I've always taken it to means as to how fulfilled or satisfying was the process of smoking the cigarette that's in question.

Q. Does it have anything to do with taste?

A. It may.

Q. Does it have anything to do with nicotine levels?

A. It may.

Q. Have you ever heard Reynolds'

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employees using interchangeably the phrase satisfaction and minimum nicotine levels necessary to make a cigarette that sells?

A. I don't recall any discussions relating satisfaction in minimal nicotine level required to get a cigarette to sell, no.

Q. Have you heard discussions where satisfaction was used interchangeably with just discussions of nicotine levels?

A. I don't recall any discussions relating to satisfaction with nicotine levels.

Q. What do you mean that satisfaction may have something to do with nicotine levels?

A. Well, what I mean is, we put some terminology or question on a ballot for a smoker to mark while smoking or after smoking, and the person that's responding to the question, can interpret satisfaction in any way they want to, and I can't presume what a smoker in a panel test would define satisfaction as, so it may be something that is related to nicotine yield of the smoke, it may be something that is related to other aspects of the smoking process.

Q. You don't know specifically how Reynolds uses the term satisfaction internally?

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A. No. Again, satisfaction could be used by different employees in different ways, for all I know.

Q. Are you aware of tests Reynolds has undertaken to determine a minimum level of nicotine that is necessary for a cigarette to be successful?

A. I'm not aware of any specific tests aimed at finding out what the minimum level of nicotine for success might be, no.

Q. Have you heard of any employees at Reynolds expressing the opinion that the main purpose of a cigarette is to deliver nicotine to the smoker?

A. I may have heard or read that opinion somewhere during my career, yes.

Q. Do you know who might have offered that opinion?

A. Well, one person who has written some in that area was Dr. Teague, Claude Teague.

Q. Do you know Dr. Teague?

A. I did not know Dr. Teague. If he walked in here I might recognize him, but I didn't know him very well.

Q. Have you heard anyone else express

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that opinion?
A. Again, I may have. I can't recall any specific persons that expressed that opinion to me, no.
Q. In terms of quantity, what alkaloid is most prevalent in tobacco smoke?
A. I presume the most prevalent alkaloid in tobacco smoke is nicotine, although I can't recall seeing -- I can recall seeing analysis results for some of the other alkaloids, so I'm only making a presumption.
Q. Do you know what alkaloid in tobacco smoke has the largest or greatest pharmacological impact on smokers?
A. No. I am not an expert in pharmacology.
Q. Do you know Dr. Lippiello?
A. Yes, I do.
Q. Have you ever worked with him?
A. He and I worked together in the biobehavioral group in the early 1980's, late 1970's.
Q. About what time, if you looked at your resume?
A. In that period between 1979 and 1981 or 1982. We were in the same group, but I don't

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recall us working on the same projects.

Q. In that time period would Reynolds have been both your and Lippiello's supervisor?

A. Yes. I believe that's correct.

Q. John Reynolds, I'm sorry.

A. I took you to mean John Reynolds.

Q. Do you know Walter Pritchard?

A. I know him, yes, sir.

Q. Have you ever worked with him?

A. I have not worked with Walter Pritchard, I don't think. I don't recall, no.

Q. Do you know Dr. Debethizy?

A. Yes. I know Dr. Debethizy.

Q. Have you worked with him?

A. Yes. I have worked with him.

Q. On what projects?

A. From 1992 through 1996, I was assigned to a unit called new business development within R and D, and in my capacity in that group, I worked with him on some of the projects that he felt were new business type projects for us to manage.

Q. What type of projects?

A. As I recall, it was a variety. One was having to do with some technology out of one of

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his groups having to do with -- it was a patented technology that came out of one of his groups. I can't recall exactly the nature of it, but our idea was to go and try to license that technology to another company.

Another project he had going on in his group that Dr. Lippiello was involved in was what was termed nicotine analogs, and the project work there involved novel drug design and the technology was to be licensed out to another company when appropriate.

Q. Is that Avoca, this new design, new product?

A. No. Avoca is a facility we have in the eastern part of North Carolina that's a research farm as well as a business unit that's within the R and D organization, but their business is manufacture and sale of flavor and aroma chemicals.

Q. And from '92 to '96, you managed Avoca, you managed that?

A. I managed the new business projects at Avoca.

Q. Did that title or role differ from your previous work at Reynolds?

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A. Yes, it did. Here I was involved in managing developments that were aimed towards new business, not part of the cigarette business.

Q. So between 1992 and July of '96, you were not involved in the cigarette manufacturing portion of Reynolds business?

A. My primary responsibilities were these two business projects. I still did some work here and there on cigarette related items.

Q. Tell me first what you did in relation to cigarettes between '92 and '96.

A. Well, I was a member of a team charged with improving consumer acceptance of some of our other light product styles. I did some work on the FDA response we talked about, some today and yesterday. I did some work on charcoal filters. Those are the ones that I recall.

Q. And the rest of the time you spent on these new products that were unrelated to cigarettes?

A. That's correct. There were new business ideas that were unrelated to cigarettes.

Q. Did any of them involve smoking cessation devices?

A. I don't believe so, no.

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Q. Was that a promotion?
A. No, it was not.
Q. Was that a position that you applied for or were asked to take?
A. I was asked to take it.
Q. Have you done any filter work since '92?
A. No.
Q. Have you been involved in the reconstituted tobacco process since '92?
A. No.
Q. Have you been involved in the expanded tobacco process since '92?
A. No.
Q. Have you been involved in the selection or effect of using additives in tobacco manufacturing since '92?
A. No.
Q. Did you assume a new position in July of '96?
A. Yes, I did.
Q. What was that position?
A. Well, we reorganized the department in 1996 in July, and I became part of a group called cigarette design research.

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Q. What does that group do?
A. We have a number of projects related to cigarette design aspects.
Q. Such as?
A. My particular project at the moment, is working on pressure drop of tobacco rods.
Q. With the overall goal of what?
A. This is a quality oriented project. What we want to do is better understand how we can moderate and control tobacco rod pressure drop.
Q. Why?
A. Because we believe that some aspects of control of the tobacco particle size, density of the tobacco and weight of the tobacco, has a bearing on smoke yields and a bearing on consumer acceptability of the finished products.
Q. What percentage of your time is working on the pressure drop of tobacco rods?
A. Approximately 50 percent.
Q. What is the other 50 percent?
A. Well, about 25 to 30 percent is on a product development team whose goal is to improve the consumer acceptance of our light product styles.
Q. How are you attempting to do that?

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A. Via our normal process of looking for changes in blends composition and cigarette construction

Q. Have you looked at all at the tar to nicotine ratios?

A. In this project we have not looked at altering the tar and nicotine ratios.

Q. In the cigarettes that Reynolds manufactures and sells today, what is the range of tar to nicotine yields from highest to lowest?

A. Do you mean tar to nicotine ratios?

Q. Yes.

A. I believe the tar to nicotine ratio range is going to be from about 14 or 15 at the high end to about nine or ten at the low end.

Q. Why are there different ratios of tar to nicotine?

A. To the best of my understanding, the ratio differences accrue from our use of ventilation of filtration and it is part of the phenomenon associated with smoke formation filtration.

Q. Is that a design criteria, that is the tar to nicotine ratio?

A. I don't believe so, no.

Q. So it is just by chance that certain

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cigarettes have a 15 to one tar to nicotine ratio and others have a nine to one?

A. Well, the range that I just quoted for tar to nicotine ratio, bears a relationship with the tar yield of the cigarette, and it turns out, that the high tar to nicotine ratio cigarettes are also the higher end tar yield cigarettes, and that's what I meant by as a consequence of the phenomena associated with smoke formation and filtration in air diluted cigarettes. When you make a lower tar cigarette, with a combination of filtration and ventilation, you end up with a lower tar to nicotine ratio.

Q. Was the position you held commencing in July of '96 a promotion?

A. No, it was not.

Q. Is that a position you were asked to take or you applied for?

A. I was asked to take it.

Q. Have you heard of a nicotine committee at Reynolds?

A. I don't recall any nicotine committee at Reynolds.

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(PLAINTIFF'S EXHIBIT NUMBER 4 WAS MARKED FOR IDENTIFICATION)

BY MR. MAISTROS:

Q. I marked this as Exhibit 4, and I'm going to ask you if you can identify that document. Can you identify this document?

A. Yes. This appears to be the course handout for a course on cigarette design given by Dr. Townsend and myself.

Q. Did you participate in the collection of materials that's in this course handout?

A. Yes, I did.

Q. On the second page of this document after the title you'll see what appears to be an index.

A. Yes. A course outline.

Q. Yes. Did you participate in the drafting of that course outline?

A. Yes, I did.

Q. How did you select the materials to put in this course outline?

A. My recollection is, that Dr. Townsend and I discussed what aspects we thought would be important to an audience, a general audience trying to understand more about cigarette design,

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and we decided which points to put in.

Q. Did you incorporate any materials that addressed the issue of cigarette designs from a health standpoint? In other words, did you select any materials specifically that addressed the responses of the cigarette industry or Reynolds in particular to criticisms by the medical and scientific community?

A. Well, I can't say that we sat down and asked ourselves do each of these points address Reynolds' responses to criticisms of scientists outside the industry, but as I tried to explain earlier, Reynolds has taken steps to reduce the smoke yields of its cigarettes over the years, and many of the points that we make in this course are related to our efforts in the past and continuing efforts for that matter to reduce yields of cigarettes.

Q. Could you turn to -- these pages aren't independently number, so you are going to have to bear with me. It is about half an inch in, and it is a paper that is entitled effective cigarette paper on smoke yield and composition by William Owens. Do you see that paper?

A. Yes, sir.

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Q. And this is one of the papers you selected for your course?
A. Yes, it is.
Q. Why did you select this paper?
A. Because it discusses the effects of cigarette paper on smoke yield and composition and one of the points that we wanted to discuss in this course was the effect of cigarette paper on smoke yields.
Q. And this is the type of paper you rely upon in arriving at your conclusions and expert opinions with respect to cigarette design?
A. Yes. It is a type of paper that we rely on for forming opinions.
Q. Do you consider this author and this paper to be authoritative on the subject of cigarette paper, smoke yield and composition?
A. I consider Dr. Owens to be very knowledgeable about cigarette papers, yes.
Q. On Page 17 of his paper underneath the summary, see the second paragraph, increasingly porous perforated papers increase puff count, selectively increase nicotine, give lower vapor phase deliveries along with the reductions in tar, carbon monoxide and nitrous

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oxide. Do you see that sentence?
A. Yes. I see that sentence.
Q. Do you agree with that sentence?
A. To a point, yes. If you refer to his figure, we had it out yesterday, a discussion on my monograph contribution.
Q. Page 5?
A. Yes. It is Page 5 is his figure two, and I think that his sentence that you pointed out in the summary is speaking to this figure, and he does show some small amount of nicotine increase over a range of perforated permeability from about a hundred, excuse me, from CORESTA units to about a hundred or so CORESTA units.
Q. So your testimony is you would agree with his statement?
A. I agree with the statement that he makes, because I know that he was referring to data that he collected in his laboratory, and I have no reason to disagree with the measurements that he made to produce this chart.
Q. Since 1970 has Reynolds increased or decreased the use of perforated papers?
A. I don't believe that we use any perforated paper.

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Q. You don't know if he's talking about -- is he talking about cigarette papers, tipping papers, wrap or what?

A. He's talking about cigarette paper here and he's talking in particular, about perforated cigarette paper in this case.

To my understanding, we use inherently permeable cigarette papers for our domestically sold cigarettes.

Q. Yesterday when we were talking about either lazar or what was the other type of process to put holes in paper?

A. Lazar is one process and pre perforation is the other. Actually, that's not a process, it is a classification of the paper, but we're referring to tipping paper in that case.

Q. When we were talking about that phenomena, would you agree that there are similar principals with respect to as you increase the perforation of tipping paper, you are going to decrease tar, carbon monoxide and nitrous oxide but not nicotine to the same levels?

A. I think we discussed that in a fair amount of detail yesterday, and what I said then and will reiterate is, when you increase the level of

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ventilation in the filter, you decrease the yield of tar, CO, carbon monoxide, oxides of nitrogen, nicotine but you don't decrease the yields of different constituents at the same rate.

Q. Right. I think you testified that nicotine was reduced at a lesser amount than the other compounds?

A. Yes, sir.

Q. Does William Owens discuss that phenomena in this paper?

A. Which phenomena?

Q. The one we just discussed of perforated or ventilation of filter on the yields of those compounds?

A. I don't recall whether he talks about filter ventilation in this paper or not. I have to read it again.

Q. As you look at your index in this document are there any of the papers that you put in here that discuss the phenomena of reduction of compounds through the use of ventilation?

A. I would have to leaf through this and review which articles are in here. I don't recall exactly which articles we included here.

Q. Could you turn to about a quarter

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inch past where you were, the section that talks about filtration of cigarette smoke, it has another index in front of it. You might recognize this graph to help you out in where we're heading. You are in the area, if you could keep going to the graph that says nicotine filter efficiency versus filter dilution.

A. I'm not finding it.

Q. Back-up a little.

MR. BELASIC: His copy is skipping that exact page. On the witness's copy it skips from develop tows to dependence implications to a chart with an efficiency and particle diameters on the X and Y access.

BY MR. MAISTROS:

Q. On this page there is a chart nicotine filter efficiency versus filter dilution. Mine has a number nine in the right-hand corner. Could you describe what this chart is?

A. Yes. It is chart showing nicotine filter efficiency as a function of filter dilution level.

Q. Across the left-hand axis is percent of nicotine removed, is that a fair

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characterization?
A. Yes. The Y access, and that's up and down on the left-hand side is a measure of the efficiency of the filter for trapping nicotine.
Q. And you talk about that in terms of yield or content for that trapping?
A. Well, this is in smoke yield, and the filter efficiency measurement is the amount of nicotine found on the filter after smoking, divided by the amount yielded in the smoke, plus that trapped on the filter, so that is an efficiency of filtration calculation.
Q. And across the bottom or the X, what does that tell you?
A. That is the amount of filter dilution expressed as the percentage of air entering the filter fence with respect to the draw and flow rate at the mouth end of the cigarette.
Q. What is the purpose of this chart?
A. It is to demonstrate that as you increase the filter dilution in the cigarette, the filter efficiency for nicotine improves, which results in reduction of nicotine yield.
Q. Is there a certain point in time where you reach a certain level of filter

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dilution where the nicotine efficiency tops off and does not increase?

A. Probably that occurs, and that's a consequence of the flow dependence of filter efficiency for particulate matter.

Q. Now, is this on a puff by puff basis or is this for a whole cigarette, what is this graph measure?

A. This is for total cigarette.

Q. Is this an example of a typical filter efficiency versus filter dilution or of a particular cigarette or both?

A. Well, this particular one, as I've noted at the top was for experiments with NOW brand cigarettes. I can tell you that as a function of filter dilution, efficiency for particulates of smoke will improve as you increase the filter dilution level in general.

Q. Is it always true that there is a level at which the filter efficiency levels off and remains static?

A. Yes. And that's a consequence of the fact that fiber filters efficiencies change with respect to flow rate through the filter and what we're doing here when we change the filter

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dilution is change the flow rate of the smoke through the filter, and as the flow rate increases or decreases, you get an expediential shape curve, so it does level out in different spots at the streams of flow rate.

Q. Could you go forward about seven pages and it is to a chart that says comparison of acetate on paper filters. Do you see that chart? It has a seven in the upper right-hand corner.

A. Yes, I have it.

Q. What is the purpose of this chart?

A. This is merely a comparison between selective removal aspects of cellulose acetate filters versus those of paper filters.

Q. And the items that are on the bottom of the graph as being selectively removed are what?

A. Formaldehyde, hydrogen cyanide, acrolein, phenol and nicotine.

Q. How were those selected?

A. We took this particular graph from an article from literature.

Q. Do you know why those five items were selected as being compared?

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A. I would have to go back to the paper and read it.

Q. Is that paper in this document?

A. I don't know whether it is or not.

Q. Why would you include this chart in your course material on cigarette design?

A. Well, one of the points that we wanted to discuss in this course, is that different filters have offenities, different filter materials have offenities for constituents of smoke that can vary. In the main, whether paper is manufactured from or -- excuse me, a filter is manufactured from paper or cellulose acetate, they have similar removal efficiencies or can be constructed to have similar removal efficiencies for the total particulate matter, but because the materials have different offenities for different constituents of the smoke, you may see minor variations in the composition of the particulate matter that exits from the filters.

Q. If you can go forward to about an inch, it is a page that is marked at number two in large heading individual variables and then below it responses.

A. Yes, sir.

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Q. What does this page represent?
A. I think in this section, that this page is part of, we were discussing predictive models, and by predictive models, I mean regression equations that we have developed that relate smoke yields to construction variables of cigarettes, and I believe this page is a summary of some of the variables that have been studied in efforts to model construction parameters effects on smoke yields.
Q. Now are these individual variables you listed, the only variables, these ten items?
A. No. I don't believe so.
Q. Do you know why these ten items were selected?
A. To the best of my recollection, they were individual variables contained within some of the studies mentioned on the previous page.
Q. What does responses mean?
A. Responses in the terminology of the type of experiment that you do to obtain these type of regression models, you have independent variables and you have responses.
Responses in this case, would be any characteristic of the cigarette that we can

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measure or wanted to measure for the purpose of study that responded to variation and independent variables.

Q. So if you changed any of those ten variables you listed, you would effect certain things such as nicotine yields?

A. Yes. And the response -- well, the effect of a variable and the response could differ, depending on the response or the variables, for example, if we picked dilution, and look at the individual variables, wrapper pososity might not have much of an effect on the filter dilution, and what I mean is, not all variables effect all responses.

Q. What does the next page represent?

A. This is a list of some responses measured in some of the experiments that we listed here. I don't know if all of these were measured in all experiments.

Q. What does the phrase mean in the middle column, total nicotine?

A. I would have to go back and check, but my recollection is that that would be the amount of nicotine retained in the cigarette filter, plus the amount of nicotine yielded in the mainstream

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smoke.

Q. And in the first column, smoke nicotine would be what?

A. The nicotine yield in the smoke, the mainstream nicotine yield.

Q. If you go forward two pages, it is entitled model uses design of new cigarettes. It is Page 3 on the bottom right-hand corner. What does this page represent?

A. I believe this page starts with some examples of how these regression models might be used in identifying potential configurations to effect a certain finished product characteristic.

Q. The use of these models, is that something Reynolds employs?

A. These particular models were early efforts in it. We do have cigarette models that we use today, but they may differ from the specific ones that are depicted here.

Q. One of the purposes of models set forth in your course book is to design or define the desired performance characteristics?

A. Yes.

Q. And one of the performance characteristics is the nicotine delivery?

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A. Yeah. We say EG, tar, nicotine, CO deliveries as possible desired performance characteristics.

Q. In fact, one of the desired performance characteristics of the cigarettes is nicotine delivery, is it not?

A. Well, so far as I know, when we manufacture cigarettes, all the cigarettes that we manufacture have a nicotine yield.

Q. Is one of the desired performance characteristics of cigarettes nicotine delivery?

A. It could be, yes.

Q. And that's of Reynolds' cigarettes?

A. Yes.

Q. Towards the back of your course material I'm going to guess it is less than a quarter inch from the back, there is a chart, a large chart that says reported nicotine transfer efficiency percentage. Why is this chart in your course material?

A. Well, I think we had a small section in here talking about tobacco in general, and this chart just shows that nicotine transfer efficiency in the definition that I described earlier, that is the amount of nicotine in the

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cigarette by virtue of its concentration of tobacco divided into the smoke yield can vary on the type of tobacco that you make the cigarette from, but in answer to your question why did we put it in here, because we had a section in here talking about aspects of the tobacco.

Q. If you read this chart, this chart would indicate, would it not, that various researchers came up with various transfer efficiency percentages, correct?

A. It appears from this chart, that if you take a particular type of tobacco, FC is fully cured tobacco, different researchers came up with somewhat different numbers.

Q. A range of 13 and a half to 15.8 for transfer efficiency for flue-cured?

A. Yes.

Q. And then they came up with numbers for both burley and Turkish, correct?

A. Yes.

Q. And then they came up with numbers for G7, which is reconstituted tobacco?

A. Yes.

Q. And G13, which is expanded tobacco?

A. Yes, sir.

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Q. Both of which were utilized by Reynolds in the 70's and 80's?
A. Yes.
Q. And 90's?
A. I don't recall when we stopped using G13 and replaced that with G19, which is the carbon dioxide expanded tobacco.
Q. Out of flue-cured, burley and Turkish, is there a ranking in which are used more by Reynolds?
A. If I recall correctly, we use more flue-cured and burley than we do Turkish.
Q. Do you know if you use more flue-cured than burley or more burley than flue-cured?
A. I can't remember the flue-cured, burley mix right now.
Q. Is it close?
A. I can't remember what that ratio is.
Q. In any event, the calculations for transfer efficiency and you are sure this chart is using that in terms of the amount of nicotine content that is transferred into nicotine yield during the smoking process?
A. I'm reasonable sure that that's the

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statistic that we are using here.

Q. The transfer efficiency of your expanded tobacco is the same as burley, correct, or greater?

A. Well, this chart says that the expanded tobacco is 8.8 percent and burley tobacco is 8.6 percent.

Q. So in fact the transfer efficiency that is the amount of nicotine yielded as a product of nicotine content is better for your expanded tobacco than it is for burley?

A. Well, I can't say whether the difference between 8.8 and 8.6 in this measurement is meaningfully different.

Q. Well, at least in terms of numbers it is better, is it not?

A. Well, the number for the expanded tobacco is .2 percent higher.

Q. Right. And for the reconstituted tobacco, it is 6.7 percent, transfer efficiency versus 8.6 for burley?

A. Well, we have one number on this chart that says G7 transfer efficiency is 6.7 percent. We have another number that says it is 8.7 percent.

Q. So it at least, based on this chart,

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the transfer efficiency in terms of nicotine is comparable for G7 and burley?

A. By one of the numbers on this chart, that's true, yes.

Q. Do you have any reason to believe that the numbers on this chart are not accurate?

A. No. I have no reason to believe the numbers are not accurate. My comments are based on some knowledge of variables of numbers like these and that's why I made comments like the difference between 8.8 and 8.6 may not be meaningfully different.

Q. At least based on this chart would you agree with the proposition that the nicotine transfer efficiency of G7, G13 and burley is fairly close?

A. From this chart, the transfer efficiency for those three types of tobacco are fairly close.

Q. Do you know who Mr. Perfetti is?

A. Yes. I know Dr. Perfetti.

Q. Who is he?

A. He is a chemist that works in our research development department.

Q. Is he a chemist that you've come to

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know?
A. Yes. I know Dr. Perfetti quite well.
Q. Is he a good chemist?
A. I believe him to be a good chemist, yes.
Q. Does he do good work?
A. I believe him to do good work.
MR. MAISTROS: Let's take a break.
(RECESS TAKEN)
(PLAINTIFF'S EXHIBIT NUMBER 5 WAS MARKED FOR IDENTIFICATION)
BY MR. MAISTROS:
Q. I show you what I have marked as Exhibit 5, and ask you to take a look at that January 4, 1978 memorandum, and tell me if you've seen it before?
A. I don't remember seeing this before.
Q. Do you know who D.P. Piehl is?
A. Yes, I do.
Q. Who is that?
A. That's Don Piehl, and he was the manager of the chemical division in the research department, I believe, in that time frame, and he was my boss.
Q. In January 4 of 1978, Dr. Piehl was your boss, correct?

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A. Yes, sir.

Q. Who was Alan Rogman?

A. Alan Rogman was the director of the research department.

Q. Was there anyone higher than Dr. Rogman in the research department in January of '78?

A. I think there may have been. At that time -- well, I don't remember who the individual was, but there may have been a higher person in the reporting chain.

Q. This document is entitled nicotine and smoker satisfaction. Do you see that in the upper left-hand corner?

A. Yes, I do.

Q. Were you aware that your department was working on a project entitled nicotine and smoker satisfaction?

MR. BELASIC: Object to the form. It doesn't say that.

THE WITNESS: I'm aware that the department was working on different aspects of nicotine and nicotine yield. I'm not aware of a specific project called nicotine and smoker satisfaction.

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BY MR. MAISTROS:

Q. Are you aware that your department was working on an objective concerning the means to alter and control tar and nicotine ratio and increase nicotine transfer efficiency?

A. Again, I'm aware in that time period and since that time period and before that time period that we worked on various means to alter the nicotine yield of cigarettes, alter the tar to nicotine ratios.

Q. And were you aware that your department was working on ways to increase the nicotine transfer efficiency?

A. Yes. I'm aware of efforts in the past to attempt to increase nicotine transfer efficiency.

Q. What efforts?

A. I don't know if I recall any specific efforts. I'm just aware that we have had efforts in the past related to that topic.

Q. And that would be efforts to increase the nicotine yield of cigarettes, correct?

A. Not necessarily. You could increase the transfer efficiency without increasing the yield.

Q. The purpose of these specific efforts, was it not, was to increase the

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efficiency by which the nicotine content was yielded in the nicotine or in the tobacco smoke?

A. I don't understand your question.

Q. Let's start with some basics. What is the purpose of increasing nicotine transfer efficiency?

A. I don't know a specific purpose for doing that. I would have to look at a specific project and try to understand what they were doing to know what their purpose was.

Q. Do you know what the phrase means nicotine transfer efficiency?

A. I believe nicotine transfer efficiency refers to the definition that I've given earlier, which is the amount of nicotine yielded in the mainstream smoke divided by the total amount of nicotine in the tobacco in the particular cigarette in question.

Q. Is it your understanding that the word increase has some meaning other than to increase the yield of the nicotine in the smoke?

A. In this particular memo, it says increase nicotine transfer efficiency, and since that's a ratio, you could increase the transfer efficiency without increasing the yield.

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Q. How?
A. If you decrease the amount of nicotine in the tobacco but somehow maintain the same smoke yield, the transfer efficiency would increase.
Q. But if you have the two different cigarettes, both with the same amount of nicotine content and you increase the nicotine transfer efficiency of one cigarette, doesn't that one cigarette yield more nicotine than the other cigarette?
A. That's another outcome of increasing the nicotine transfer efficiency.
Q. Were you aware that in this time period Reynolds was working on an objective of defining the optimum nicotine level in cigarette smoke required to maximize smoker satisfaction?
A. I'm aware of efforts that we've made in attempts to find an optimum nicotine level and an optimum tar to nicotine ratio.
Q. Were you aware of objectives of Reynolds to determine the existence of a minimum or threshold value of nicotine required for satisfaction?
A. I didn't recall efforts like that until I saw this memo.

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Q. So until November 19 of 1997, you weren't aware that Reynolds was exploring the minimum or threshold value of nicotine required for satisfaction?

A. Yes. As I said, I didn't recall having heard about any work in that area before.

Q. Before today?

A. Before today.

Q. If you go to the third page, at the top it says flue-cured tobacco, most important nicotine contributor. Do you see that?

A. Yes, I do.

Q. Is that a concept that you were familiar with in 1978 when your department was doing this research?

A. I probably was not aware of that concept in 1978.

Q. Are you aware of it now?

A. Now that I've read it I am.

Q. Were you aware in 1978 that data collected on major components show that flue-cured tobacco has the highest tobacco to smoke nicotine transfer efficiency?

A. I'm aware of studies like the one we talked about a few minutes ago that was in my course

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book that show that straight grade cigarettes made of one type of tobacco can have different nicotine transfer efficiencies, yes.

Q. And in fact, you were aware when you put together your course book, of the various transfer efficiency rates of the various types of tobacco, were you not, so far as nicotine was concerned?

A. Yes. I was aware that different cigarettes made of one type of tobacco can have different nicotine transfer efficiencies.

Q. Were you aware that uncased burley tobacco has a nicotine transfer efficiency comparable to that for flue-cured tobacco?

A. I don't recall the dependents of casing on transfer efficiency. I think I mentioned earlier today, that when you put casing on tobacco, you are going to change the net content of -- yes, the net content of nicotine in a cigarette based on displacement of tobacco by casing and that may be the effect that you are referring to here, I don't know.

Q. Were you aware of the fact that despite the fact that burley tobacco usually has a higher nicotine level, flue-cured tobacco

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contributes more nicotine in most blended cigarettes than any other blend component?

A. Well, again, I'm aware that if you make straight grade cigarettes, that is cigarettes made of one type of tobacco, you can get variations in the nicotine transfer efficiency. What I am not sure of, and I question whether anybody is all that sure of it, is what is the net effect on transfer efficiency from nicotine in a blended cigarette.

Q. Listen carefully to my question. Were you aware that burley tobacco has a higher nicotine level than flue-cured tobacco?

A. Yes. I think I've read that before.

Q. Were you aware of that in 1978?

A. In 1978 I may not have been aware of that. In 1978 I wasn't working with tobacco that much, I was working with filtering in the cigarettes.

Q. When were you first made aware that burley tobacco has a higher nicotine level than flue-cured tobacco?

A. I don't recall when I learned that burley tobacco had a higher nicotine content.

Q. In the next paragraph it says, experiments with nicotine added as the free base

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and malate salt to various blend components show that it transfers less efficiently six to eight percent than inherent nicotine and with little difference between tobacco types.

Were you aware of that work that was going on at Reynolds in '78?

A. No. I don't believe so.

Q. Were you aware that much higher transfer efficiencies were achieved when nicotine malate was added to denicotize tobacco used in the Reynolds number one cigarette?

A. No. I don't recall seeing that before reading this memo.

Q. Why was Reynolds in 1978, looking at the issue of the minimum amount of nicotine necessary to provide smokers with satisfaction?

A. I don't know.

Q. You don't know if it had to do with taste or pharmacological effects or both?

A. It could have had to do with taste. I don't know about pharmacological effects.

Q. Do you kno· if Reynolds ever determined if there was an optimum nicotine level in cigarettes?

A. I know of a number of attempts to modify

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tar to nicotine ratios and find some optimum. I don't know whether they ever, the people who were involved in that ever decided on an optimum level or not.

Q. I'm not talking about ratios, I'm just talking about optimum nicotine levels. Do you know if Reynolds ever identified an optimum nicotine level for cigarettes?

A. I don't know if we ever identified an optimal level, no.

Q. On the last page, do you see the people that have contributed to this work?

A. Yes, sir.

Q. Do you know those people?

A. Yes, sir.

Q. Who are they?

A. Dr. Henley was a chemist, he's now retired, working at the research department. Dr. Dickerson was a chemist working in the research department, he's now retired. Dr. Newman was a chemist working in the research department. Mr. Shannon was a chemist working in the research department. Dr. Stowe was a chemist working in the research department. She was one of my supervisors. Dr. Ritz was a chemist

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working in the research department. Dr. Len is a chemist who still works in the research department. Dr. Perfetti is a chemist who still works in the research department, research and development, I mean. And Miss Wallace was a chemist working in the research department. She's no longer with the company.

Q. Did you come to know these nine individuals?

A. Yes. I know each of these individuals more or less.

Q. Are there any of these nine individuals that you would deem to be untrustworthy or not credible?

A. No. So far as I know, each of these individuals are trustworthy and credible.

Q. You have no reason to disbelieve anything that these nine individuals have to say about their work at Reynolds?

MR. BELASIC: Object to the form. It calls for speculation.

THE WITNESS: Well, I think in general I know these people to be good scientists and good chemists. I don't think they would knowingly misrepresent their research results. I

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can't say that I would agree with everything that each of these individuals would say.

BY MR. MAISTROS:

Q. I'm not you asking to do that. I'm just asking, do you have any reason to believe that any of these individuals would lack credibility?

A. No. I don't have any reason to believe that any of these individuals would lack credibility.

(PLAINTIFF'S EXHIBIT NUMBER 6 WAS MARKED FOR IDENTIFICATION)

BY MR. MAISTROS:

Q. I'm going to hand what you I have marked as Exhibit 6 and ask you if you have seen this document before. Have you seen this document before?

A. I don't recall seeing this particular document, no.

Q. Have you ever heard of nicotine reduction program?

A. Yes, I have.

Q. What is that?

A. I believe this was in part related to our efforts to develop a low nicotine yield cigarette

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in response to a competitor's product.

Q. And what is the association of REST, R-E-S-T, to those efforts?

A. Well, the REST process, the idea there is that you could take water solubles out of tobacco, treat the extract to remove selected constituents from the extract and then reapply that to the tobacco, and I think in this particular application, REST was being thought of as a means to reduce the tobacco nicotine content.

Q. If you can turn into this document towards the end, it is five pages from the end, there is a chart. Do you see that chart by J.E. Stewart dated 12-18-89?

A. Yes.

Q. And at the top of the chart it describes, does it not, the REST process?

A. Yes, it does.

Q. Could you go through that chart and describe what it depicts?

A. Well, there is two sections of this chart, one showing what is labeled the REST process, and this shows starting blended cut filler, going through a water extraction, re-equilibration, a

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deliquoring process, which I am not sure I know the nature of that, and a drying process, and at the end it says control nicotine cut filler blend.

Q. So the end product of the REST process is a controlled nicotine cut filler blend?

A. As I said, in this application, I think the idea was to use the REST process to reduce the nicotine content of the tobacco for this low nicotine development project.

Q. How about the bottom?

A. The bottom process appears to depict a way to remove nicotine from the extract, and it shows the water extract coming from the box I just described going through a concentration step, solvent de-nicing, ammonia distillation and then an adjusted nicotine extract being reapplied to the cut filler.

Q. What product does it show is being used to facilitate solvent de-nicing?

A. Well, it shows a line here drawn to water/ammonia.

Q. Were you familiar with that process?

A. Not in this particular form. I'm aware

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that in burley de-nicing process I may have
mentioned yesterday we used ammonia to facilitate
reduction of nicotine contents of burley tobacco
for a period of time.

Q. Where is the bottom chart showing the
nicotine adjusted extract going?

A. There is an arrow here pointing to
something called nicotine by-product.

Q. Up above on the right where is the
arrow showing the nicotine adjusted extract
going?

A. There is an arrow pointing up to the first
box indicated in the chart to a box labeled
re-equilibrate.

Q. Who was J.E. Stewart?

A. That's John Stewart, and he's an engineer
that works in the engineering department now. He
was formerly in the research and development
department.

Q. Could you go to the next page,
please. Were you aware that Reynolds was
considering all the REST applications such as
those outlined in this page in the bottom?

A. I was aware that we had a low nicotine
product development exercise going on in the time

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period that this document came from. I was aware that REST was an alternative for processing the tobacco to go into this. I was aware of efforts to deproteinize tobacco, but I wasn't aware that REST was the process used to do that.

Q. Were you aware that an alternative REST application was controlled nicotine?

A. Well, to me, using REST to remove nicotine content is part and parcel of controlling nicotine. We've had other projects going on that I'm aware of that sought to decrease the tar to nicotine ratio, and REST may have been used for that purpose. Again, it was an experimental process that had a broad range of potential applications.

Q. What was the use of REST for controlled ammoniation?

A. I don't know.

Q. And what was the use of REST for denitrification?

A. I think what they were trying to do there was take the water soluble extract and remove the nitrates from that water extract and then reapply the reduced nitrate extract to the tobacco.

Q. And the next page you see the 1990

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plans recommended. Were you aware that those plans were recommended in 1989 or '90 by Reynolds?

MR. BELASIC: Object to the form. There is no foundation.

THE WITNESS: I was not aware of these specific plan elements and timings. I was aware of our efforts in R and D to develop a low nicotine content cigarette.

BY MR. MAISTROS:

Q. And a controlled nicotine product?

A. And again, I'm not sure what controlled nicotine means. It could be related to the low nicotine cigarette. It could be related to our development experiments on a low tar to nicotine ratio cigarette.

Q. Go to the last page, please. What is the alternate REST application process effect, the first one listed?

A. It says control nicotine.

Q. And what is the product issue next to that?

A. It says target appeal, toxs.

Q. What is the program next to that?

A. LN, XGT, fund, period.

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Q. Do you know what that represents?
A. I believe LN represented the low nicotine product development project we were talking about. XGT, I believe referred to our efforts to develop a low tar to nicotine ratio cigarette, and fund may represent fundamental research.
Q. What does S and C mean?
A. I don't know.
Q. Under process effect controlled ammoniation, do you see that?
A. Yes.
Q. Do you know what that means?
A. Controlled ammoniation?
Q. Yes.
A. I don't know what that refers to, other than what it says.
Q. Do you know what YYAS means in the far right-hand column?
A. No.
Q. And in 1990, what position did John Reynolds hold?
A. I think in 1990, he was part of or maybe manager of the biobehavioral group.
Q. And what position did Gary Berger hold?

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A. I think that in 1990, Dr. Berger was in charge of the product development area, new product development area.

Q. What position did Dr. Suber hold?

A. I think Dr. Suber was head of the toxicological assessment group. That might not be the right name for it.

Q. What position did Dr. Green hold?

A. Dr. Charlie Green, Charles Green?

Q. Yes.

A. I don't recall where he was located and what.

Q. How about Dr. Hayes, Wallace Hayes?

A. Dr. Hayes was in charge of the larger part of the organization that dealt with toxicological issues, and I believe that Dr. Suber reported to Dr. Hayes at that time.

(RECESS TAKEN)

BY MR. MAISTROS:

Q. I believe you testified yesterday, that you had prepared a report for the Pennsylvania case. Did you testify to that?

A. Which Pennsylvania case?

Q. Arch or Barnes?

MR. BELASIC: That's not true.

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MR. MAISTROS: That's not true?

MR. BELASIC: No.

BY MR. MAISTROS:

Q. Were you ever to be an expert in Arch or Barnes?

A. I think I might have been listed in the Arch case at one time.

MR. BELASIC: I can answer that. Mr. Norman was never listed in the Arch case. I'm sorry, let me correct the record. Mr. Norman was originally listed as our expert on cigarette design, and was later replaced by Dr. Townsend. That's correct. I'm sorry.

MR. MAISTROS: What were you thinking of?

MR. BELASIC: I was thinking of something else.

BY MR. MAISTROS:

Q. Do you know why you were replaced as an expert in Pennsylvania?

A. No, I do not.

Q. Do you know what a pectate amide is?

A. No, I don't.

Q. Do you know what a pectate is?

A. I don't know what a pectate is. It may

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refer to some salt form of pectin, and I say that, because that form of the word pectate or a-t-e end normally refers to a salt form of something in chemistry.

Q. Do you know if Reynolds ever used gaseous ammonia in its reconstituted or expanded tobacco process?

A. I don't know for certain whether we used gaseous ammonia in either process, no.

Q. What was Lawrence Hayes' position in about '76 to '78 time period?

A. Lawrence Hayes, so far as I know, was a chemist working in the research department during that time frame.

Q. Same as you? Is that what you were doing in '76 to '78?

A. I was a chemist in the research department at that time. Mr. Hayes was a more senior employee than I was.

Q. And Tom Perfetti, what was his position in that time period?

A. He was a chemist in the research department. I believe Dr. Perfetti started with research department in 1977.

Q. We've talked a little bit about the

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purposes of using both diammonium phosphate and ammonia in the reconstituted tobacco process. Is it your testimony, that neither of those compounds were ever used to improve the nicotine transfer efficiency as you define it, of tobacco?

A. I'm not aware of any commercial use of diammonium or ammonia to effect nicotine transfer efficiency in products that we sell.

Q. And that answer would apply also with respect to the use of gaseous ammonia?

A. Yes, I believe so. The gaseous ammonia may have been used in the burley de-nicing process that I referred to earlier in my testimony, but I don't know whether that effected the nicotine transfer efficiency as I've defined it.

Q. That de-nic process you talked about, it is your understanding, that any water solubles, including nicotine that were removed, were disposed of?

A. The burley de-nic process that I described before, I don't think involved any extraction. I think the process there was treatment of the burley tobacco with ammonia to effect a release of nicotine, and my understanding is that that nicotine was disposed of in commercial practice.

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Q. That's different from KDN or is it the same?
A. The burley de-nic process was called DKN.
Q. It is your process at no time for no purpose was any of the removed nicotine in the KDN process put back into any tobacco in the manufacturing process?
A. No. My understanding is that we did not use any nicotine that resulted from that de-nicing process in commercial products.
Q. Do you know if Reynolds experimented with adding nicotine derived from the DKN process derived in the tobacco manufacturing process?
A. We may have experimented with adding nicotine from that process or other processes.
Q. Do you know if the addition of ammonia in the manufacturing process has the effect of increasing nicotine transfer efficiency?
A. I'm not aware of any effect of processes used that include ammonia that would result in a change in the nicotine transfer efficiency.
Q. That answer would be the same if I substituted diammonium phosphate for the word ammonia?

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A. Yes, it will.

Q. Or any form of ammonia?

A. Yes, sir.

Q. Was there ever a point in time where Reynolds sprayed nicotine onto its reconstituted sheet?

A. I'm not aware of any commercial reconstituted sheet where nicotine per se has ever been sprayed on it, no.

We manufacture reconstituted sheet in the manner that I described earlier, where we put a water extract that came from the tobacco back on the base webb and that water extract contains nicotine.

Q. Is that water extract sprayed back on?

A. I don't know the exact method of the application to the webb.

Q. Let me show you what I will mark as Exhibit 7.

(PLAINTIFF'S EXHIBIT NUMBER 7 WAS MARKED FOR IDENTIFICATION)

BY MR. MAISTROS:

Q. This is a January 30, 1978 memo by Thomas Perfetti and Lawrence Hayes. Those are

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two individuals that you know, correct?
A. Yes. I know both of these individuals.
Q. And they worked in your department in January of 1978?
A. Yes, they did.
Q. What is the title of this document?
A. The title says, improved ammoniated reconstituted sheet.
Q. What does the first sentence underneath memorandum say?
A. Underneath the summary it says chemically bonding ammonia as the pectate MI and nicotine as the pectate salt. I can't read the next word, ammoniated reconstituted tobacco sheet should improve the nicotine transfer and flavor of RJR tobacco products.
Q. My copy says chemically bonding ammonia as the pectate amide, and nicotine as the pectate salt into ammoniated reconstituted tobacco, I'm sorry, reconstituted sheet should improve the nicotine transfer and flavor of RJR products.
Was that a concept I take it you were not familiar with?
A. I don't recall reading about this concept

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before, no.

Q. What is the second or the next sentence say? I'll read mine. Nicotine transfer may be increased by the incorporation of ammonia in the form of the pectate amide in reconstituted tobacco sheet. Is that something you are unfamiliar with?

A. Yes, it is. I have not -- I don't recall ever reading about this idea before

Q. The next sentence says, this may be achieved by the addition of ammonia phosphate either in the form of ammonia or diammonium phosphate in the pulping process. It is known that ammonia is used to breakdown the pectin in tobacco. Is that something you are unfamiliar with?

A. The part about ammonia and breaking down pectin, I think I referred to yesterday in the discussion about strengthening the sheet, and we know that ammonia or ammonia compounds when used to treat the pulp material, releases these pectinaceous or cellulose type compounds, and that's one of the ways that ammonia treatment can increase the strength of the sheet.

Q. How about, it is believed that pectin

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chemically binds the ammonia and available nicotine as an amide and nicotine salt effectively. Is that something you are familiar with?

A. No, it's not.

Q. These compounds, therefore, will be chemically bound into the sheet. Is that something you are familiar with?

A. No. I'm not familiar with that concept.

Q. The transfer of nicotine may be enhanced by this process since the nicotine pectate is relatively thermally stable. Is that something you are familiar with?

A. I'm not familiar with that concept, no.

Q. The temperature needed for the release of free nicotine from the salt occurs at a temperature higher than that heeded for paralysis of nicotine. Is that something you are familiar with?

A. No. I'm not familiar with that idea.

Q. What this may mean is that in our present reconstituted sheet where most of the nicotine is sprayed onto the surface, paralysis of nicotine may be taking place before sufficient quantity is transferred. Is that something you

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are familiar with?

A. No. I'm not familiar with that idea.

Q. Were you familiar that most of the nicotine was sprayed onto the surface of the reconstituted sheet?

A. In the manner that I described earlier, when we make a reconstituted sheet, we take the water extract, separate it from the pulpy material that forms the base of the sheet, then reapply the water extract. The water extract contains nicotine.

Q. The next sentence says, the proposed ammoniated sheet should resist nicotine paralysis and merely cleave the salt, releasing more intact free nicotine into the mainstream. Is that something you are familiar with?

A. No, I'm not.

Q. At present the ammoniated sheet uses ammonia gas. Is that something you are familiar with?

A. Well, as I said before, I wasn't aware of our use of ammonia gas.

Q. Is it your testimony today that this is the first time you were aware that there was work going on to increase the transfer of

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nicotine on the reconstituted sheet?
A. I think I may have been aware of work revolving around changing transfer efficiency in processed tobacco or cigarette designs. This document appears to be a suggestion or a possible invention disclosure. I have no way of knowing whether this was ever used in any kind of commercial practice.
Q. Well, you can tell from this sheet, can you not, that reconstituted tobacco sheets were ammoniated in 1978?
A. That's the suggestion made in the body of this text, yes, sir.
Q. And you can tell from this sheet, can you not, that at least the purpose of the research in this document was to improve the manner in which nicotine transfer efficiency took place in that ammoniated sheet?
A. Well, again, what I believe this document to be by the label on it, which is CIM and that stood for concept of invention memorandum, is a suggested way to change transfer efficiency characteristics in reconstituted sheet.
I don't know what research has done to back this up, but I'm aware of a number of research

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efforts that have gone on in the past at R.J. Reynolds aimed at changing the nicotine transfer efficiency changing the yields in the smoke.

We were conducting this type of work for a number of reasons. One, we were trying to serve consumer demands, one being, especially in this time period, at the suggestion of health researchers who were recommending that we tend to develop cigarettes with medium nicotine yields and lower tar yields, one of them being M.A. Russell, and another being Geo Gori.

Q. Would this sheet change your testimony at all in terms of what you believe to be the purpose of or effect of ammoniated reconstituted tobacco sheet?

A. No. I don't think so. I think that what we have here are some researchers who are looking at the possibility that ammonia might change the transfer efficiency of nicotine from the finished sheet, but today in commercial practice, what we use ammonia for, whether it be ammonia or ammonia containing compounds, is for improved flavor and improved strengths in reconstituted sheet. I mean, that's the commercial use that I am aware of right now.

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Q. Who was Chin Le?
A. Chin Le was a scientist. I don't believe he was a chemist. I think he was -- his education and training were in one of the biological fields, and he -- my recollection was that he worked in a lab where they did this Ames essay.
Q. How about Elizabeth Reed?
A. Elizabeth Reed is someone who, I believe, worked with Dr. Le in the lab where they conducted Ames essays.
Q. What is aqueous ammonia as opposed to gaseous ammonia?
A. Well, aqueous ammonia is ammonia gas dissolved in water?
(PLAINTIFF'S EXHIBIT NUMBER 8 WAS MARKED FOR IDENTIFICATION)
BY MR. MAISTROS:
Q. Exhibit 8 is A May 9, 1983 memo authored by Chin Le and Elizabeth Reed. Do you know what department they were in in 1983?
A. Well, from this report, it says fundamental R and D.
Q. How did that differ from the department that you were at?

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A. I believe at that time, I was in the applied R and D group within R and D.

Q. Have you ever seen this document before?

A. I don't recall seeing this document before, no.

Q. Were you aware that in 1983, Chin Le and Elizabeth Reed had done a summary of all of the research done by Reynolds since 1978 on Ames testing of smoke condensates?

A. No. I wasn't aware of their review of that research, no.

Q. Were you aware that in the course of their literature review, they had determined that in 1979, Reynolds had done research that indicated that ammoniation increased the mutagenicity of flue-cured tobacco?

A. No. I wasn't aware of that finding.

Q. Were you aware of any research Reynolds had done to determine the mutagenicity effects of ammoniation?

A. No, I was not.

Q. Do you believe that determining the mutagenicity effects of ammoniation is relevant to your opinion on what efforts Reynolds has

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undertaken to design a cigarette that responded to the criticisms of the medical and scientific community?

A. Not necessarily, no. It may or may not be relevant.

Q. Are you concerned with mutagenicity levels of tobacco?

A. I'm not aware of us measuring the mutagenicity of tobacco. I know that we measure mutagenicity of smoke condensate from cigarettes.

Q. Is mutagenicity of smoke condensate of cigarettes something of which you have a concern or interest in?

A. Well, mutagenicity of smoke condensate is measured by the Ames test is one of the essays that we can do that may or may not be relevant to health risks of smokers, and as far as I know, we don't know the link between mutagenicity as measured by Ames essay and any human health concerns, although we do use it as screening.

Q. In your pre monograph didn't you have chapter after chapter of the Ames result?

A. I don't know about chapter after chapter. I know there is some discussion about the Ames test in the monograph.

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Q. Don't you do the Ames test on EW in your test market?
A. I don't know specifically whether we tested smoke from EW in the Ames test. We may have.
Q. Did you use the Ames test on Eclipse?
A. Again, I don't know whether we performed Ames tests on Eclipse or not.
Q. Were you aware that in 1980 research was done which indicated that gaseous ammonia produced tobacco which yielded tar with mutagenicity with 43 percent higher than controlled tar?
A. No. I was not aware of that finding.
Q. I take it then that you have not done or are offering any opinion on the responsiveness of Reynolds to medical and scientific criticisms literature review on the Ames testing insofar as nicotine is concerned?
A. I don't understand your question.
Q. In offering your opinion, your expert opinion that Reynolds has done everything it can to produce a cigarette in response to scientific and medical criticisms, have you done a literature review of the research Reynolds did in the past on such issues?

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A. No. I haven't done a specific literature review on what Reynolds has done in the past.

Q. So you would not be able to offer an opinion that Reynolds did or did not undertake any specific research at any specific time concerning health issues related to smoking?

A. I have some general awareness of what Reynolds has done in the past to change the smoke yields of cigarettes to the extent that smoke yields of cigarettes are related to health risks, I think that's relevant.

Q. Before today, have you ever seen a review of literature on Ames test on smoke condensates?

A. I may have seen a review of Ames tests on smoke condensate. I don't recall seeing this particular one.

Q. Did you see a review of Reynolds' Ames test on smoke condensates?

A. If I've seen a review, it would have been a Reynolds review.

Q. Prior to today, were you aware that ammoniation increased mutagenicity of flue-cured tobacco?

A. No. I was not aware of that.

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Q. Do you consider Claude Teague to be a respected scientist?
A. I'm not familiar with Claude Teague's scientific work.
Q. You don't know what his reputation is within Reynolds?
A. No. Again, I mentioned earlier today, I never had an opportunity to work with Claude Teague or know much about him.
Q. Have you ever heard anyone speak disparagingly of Claude Teague, that is within Reynolds?
A. I don't recall hearing anybody speak disparagingly, no.
Q. What was his position when he was employed at Reynolds?
A. I don't know.
Q. Was he above you?
A. I think so, yes.
(PLAINTIFF'S EXHIBIT NUMBER 9 WAS MARKED FOR IDENTIFICATION)
BY MR. MAISTROS:
Q. Let me show you Exhibit 9, and ask you if you have seen this document before, entitled research planning memorandum on the

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nature of the tobacco business an the crucial role of nicotine therein.

A. I don't recall seeing this memo before.

Q. Let me ask you as a chemist and scientist if you agree with some of the statements in this document. First of all, Page 1, nicotine is known to be a habit forming alkaloid, hence the confirmed user of the tobacco product is primarily seeking the physiological satisfaction derived from nicotine and perhaps other active compounds. Do you agree with that statement?

A. No, I don't.

Q. And what do you disagree with?

A. Well, I don't know what physiological satisfaction is. I'm a chemist, not a physiologist. I don't know the extent to which nicotine is a habit forming alkaloid.

Q. I mean, do you disagree with it because you don't know what those two things mean, or do you disagree with it because you know what those things mean and Mr. Teague is wrong?

A. Personally I think Mr. Teague is wrong, because I believe that smokers may use cigarettes for purposes other than physiological

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satisfaction.

Q. He doesn't eliminate other purposes. What he says is, that nicotine is known to be a habit forming alkaloid, hence the confirmed user of tobacco products is primarily seeking the physiological satisfaction derived from nicotine and perhaps other compounds.

MR. BELASIC: Object to the form. I mean, now you are arguing with him about what Claude Teague means in that sentence that we can all read.

MR. MAISTROS: What he says, not what he means.

MR. BELASIC: Objection, argumentative, calls for speculation.

BY MR. MAISTROS:

Q. Do you know what a habit forming alkaloid is?

A. No. I'm not an expert in habit forming or physiology and that sort of thing.

Q. So you are going to disagree with Dr. Teague without even knowing what a habit forming alkaloid is?

MR. BELASIC: Objection, argumentative.

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THE WITNESS: Yes. I don't agree with the premise that the primary reason people smoke is for physiological satisfaction derived from a habit forming alkaloid.

BY MR. MAISTROS:

Q. He says physiological satisfaction derived from nicotine. Do you know what physiological satisfaction is?

A. I think it could mean a lot of different things. I don't know what physiological satisfaction he's referring to here, other than the first part of the sentence says nicotine.

Q. Second sentence says, his choice of product and pattern of usage are primarily determined by his individual nicotine dosage requirements and secondarily, by a variety of other considerations including flavor and irritancy of the product, social patterns and needs and the like. Do you agree with that statement?

A. No, I do not.

Q. What do you disagree with?

MR. BELASIC: You skipped a sentence there, counsel.

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BY MR. MAISTROS:

Q. You are right. Let me start over. His choice of product and pattern of usage are primarily determined by his individual nicotine dosage requirements, and secondarily by a variety of other considerations, including flavor and irritancy of the product, social patterns and needs, physical and manipulative gradifications, convenience, health, health consequences and the like. Do you agree with that statement?

MR. BELASIC: Health considerations.

MR. MAISTROS: That's what I said.

BY MR. MAISTROS:

Q. Do you agree with that statement?

A. No, I don't.

Q. What do you disagree with?

A. Well, he's listed off a number of considerations that somebody might make about their choice of products, and chosen to say that product choice is primarily determined by individual nicotine dosage requirements. I don't think we know that.

Q. You don't know that, and specifically, you have no idea and you couldn't offer an opinion, could you?

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A. I don't think we know how to rank the reasons people smoke as to what is most important and what is the least important.

Q. And you individually do not know and could not offer an expert opinion on what if any nicotine dosage requirements the typical smoker has, correct?

A. I can't offer an opinion on individuals' nicotine dosage requirements. I don't know what that would be.

Q. On Page 5, first full paragraph begins, if what we have said about the habituated smoker is true, then products designed for him should emphasize nicotine, nicotine delivery efficiency, nicotine satisfaction and the like. What we should really make and sell would be the proper dosage form of nicotine with as many other built-in attractions and/or gradifications as possible, that is an efficient nicotine delivery system with satisfactory flavor, mildness, convenience, costs, et cetera. On the other hand, if we are to attract the nonsmoker or presmoker, there is nothing in this type of product that he would currently understand or desire.

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We have deliberately played down the role of nicotine, hence the non smoker has little or no knowledge of what satisfaction it may offer him and no desire to try it.

Do you agree with that last sentence?

A. I'm not sure I understand that sentence.

Q. Do you know what it means to down play something or play down?

A. Yes. I believe I know what it means to down play something.

Q. Do you know what the word deliberately means?

A. I know what the word deliberately means.

Q. What is it you don't understand about the sentence?

A. Well, I think what he is trying to say in that sentence, it looks like to me is that we haven't explained to smokers what the role of nicotine is, so therefore, people don't want to smoke, and I don't understand that concept. I mean, people buy cigarettes all the time and we don't explain what the role of nicotine is.

Q. You would agree, would you not, that Reynolds did not explain the role of nicotine, at least in the 1970 time frame?

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A. I'm not aware of any advertising or communication we made with our customers about the role of nicotine.

Q. Are you aware that Reynolds deliberately played down the role of nicotine?

MR. BELASIC: Objection, there is no foundation.

BY MR. MAISTROS:

Q. At least according to Dr. Teague?

MR. BELASIC: Same objection. Don't suggest that Dr. Teague agrees with what he wrote there.

THE WITNESS: Would you repeat that?

BY MR. MAISTROS:

Q. Do you agree that Reynolds deliberately played down the role of nicotine?

A. I would agree that Reynolds didn't advertise any story about what the role of nicotine is. I don't know whether that was deliberately or not.

Q. Little bit down below that it says, would it not be better in the long run to identify in our own minds and in the minds of our customers what we are really selling, i.e., nicotine satisfaction. Do you agree with that

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hypotheses or statement?
A. I guess what I would say is, I don't know whether it would be better in the long run or not. I have not -- that looks like to me a total speculation.
Q. Do you agree with the statement that what Reynolds is really selling is nicotine satisfaction?
A. No. I don't agree with that. I think that people smoke cigarettes for potentially a variety of reasons. Nicotine satisfaction may or may not be one of those reasons.
Q. Well, do you know what role nicotine plays in a person's decision to smoke?
A. No, I do not.
Q. Do you know what role nicotine plays in a person's decision to continue smoking?
A. No, I do not.
Q. Do you know if people develop tolerance to nicotine?
A. I don't know if people develop tolerance to nicotine.
Q. In the next page, Page 8, Dr. Teague has a heading indicated research department activities and approaches, and he lists seven,

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eight items. Do you see that? Do you see that list?

A. Yes, sir.

Q. Do you know if any of those recommended research activities were undertaken by Reynolds?

A. Yes. I think we've had research at Reynolds on some of the propositions that he's listed here.

Q. Which ones?

A. We've talked about some research efforts today in my testimony about identifying optimum tar to nicotine ratios and optimum levels of nicotine in smoke. That's one of his suggestions here. There has been some work at Reynolds pointed at physiological and psychological effects of nicotine and smoking.

Q. Anything else?

A. No, sir. Those are the two that I can think of.

Q. Number four says, study design or availability of new or improved system for delivery of nicotine which will provide the minimum satisfaction amount of nicotine in an attractive form free of allegedly harmful

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combustion products. Do you believe Premier fits that category?

A. Yes. I think Premier could fit this description.

Q. Number five says, study means for enhancing nicotine satisfaction via synergistics, alteration of PH or other means to minimize dose level and maximize desired effects, you know of no research that was undertaken in that area?

A. I know of research where people have looked at smoke PH and tried to connect smoke PH with different process and conditions of the tobacco, but I don't know that that was done for the reasons that he's suggesting here.

Q. Back-up to number one, recognize the key role of nicotine in consumer satisfaction and design and promote our products with this in mind.

It is your testimony that that research has not been done at Reynolds or that that approach has not been taken?

A. I don't believe that we've taken that approach in our products at all.

(PLAINTIFF'S EXHIBIT NUMBER 10 WAS MARKED FOR IDENTIFICATION)

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BY MR. MAISTROS:

Q. Exhibit 10 is a May 17, 1976 memorandum from Dr. Rogman. It is entitled planning assumptions and forecast for the period 1977-1086 for the R.J. Reynolds Tobacco Company. Have you seen this document before?

A. I don't remember ever seeing this document before.

Q. Have you seen similar documents at Reynolds?

A. I may have seen similar documents to this.

Q. Did you ever participate in the preparation of such documents?

A. Well, this document and similar ones are planning documents, and in the time frame that's indicated here in 1976, any participation I would have had is informing my supervisor of the work plans that I had, and they may or may not have been captured in such a planning document.

Q. Could you go to Page 18, they are numbered at the top. Underneath products, do you see what F says down on the left?

A. Yes.

Q. Were you aware that in 1976, Rogman was anticipating that in the planning period of

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'76 to '86, that other nicotine delivery systems not involving combustion EG in chewable lozenges or beverage form may appear, however, this type of product may come under FDA scrutiny.

The question is, are you just aware that that was a contemplated product that could be developed?

A. In 1976, I was not aware that that was a product that was contemplated. I've heard of concepts like that being investigated over the years.

Q. The next page at the top, it says, as less tobacco and more extender is used in cigarettes or as novel smoke generator systems come into use, FTC tar and nicotine numbers will inevitable increase with the company decrease in smoke quality. This implies an increase in needs either for needs to restore or maintain level of nicotine flavor and the like or for methods to improve the conversion of tobacco components to smoke flavorant during the smoking process. Were you aware of that concern in 1976?

A. I probably was not aware of that concern in 1976. I think that what is captured in that paragraph is a focal point of our work over the

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years and that is that as we reduce yields of cigarettes we need to find ways of making them more flavorful.

Q. And you need to find ways to restore or maintain levels of nicotine?

A. That has been an idea as I described before, but we manufacture low tar cigarettes now. They are in some respects lacking in flavor and, you know, what I was referring to was the fact that part of this is an ongoing theme and that is trying to find ways to make cigarettes more flavorful.

We have from time to time researched ways to make lower nicotine yield cigarettes for given tar as well as higher nicotine cigarettes for given tar and in both cases, we were trying to respond to both what we thought would be a consumer demand for either of those ideas as well as criticisms from smoking and health people.

Now, in the 1976 time frame, I know that Dr. Geo Gori suggested medium nicotine yield cigarette and combined with a lower tar yield as did the Russell Commission. That may have come a little bit later, but that may have been what this reference is to.

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Q. Well, when did you first recognize that as nicotine and tar numbers decreased, you would have to find means to restore or maintain levels of nicotine?

MR. BELASIC: Objection, misstates his testimony. You can answer it.

THE WITNESS: Would you repeat the question, please?

BY MR. MAISTROS:

Q. Do you agree with the proposition as nicotine and tar numbers decrease, there is an accompanying decrease in smoke qualities?

A. I agree that there is some decline in the taste of the product, yes.

Q. Do you agree with the statement that this implies an increasing need either for means to restore or maintain levels of nicotine flavor and the like or for a method to improve the conversion of tobacco components to smoke flavorant during the smoking process?

A. I agree that when tar yields decline there is a reduction of level of taste that you get and that means that we need to look for ways to get additional flavor into the smoke. It doesn't necessarily mean increase the nicotine yield.

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(PLAINTIFF'S EXHIBIT NUMBER 11 WAS MARKED FOR IDENTIFICATION)

BY MR. MAISTROS:

Q. Exhibit 11 is a May 7, 1986 memorandum from Dr. Eaker to Dr. Green. Do you know who those individuals are?

A. Yes, I do.

Q. Who are they?

A. Dr. Green is a chemist who works in the research department or research and development department. Dr. Eaker, is a chemist who formerly worked in the research and development department. He is no longer with the company.

Q. And you worked with both of these gentlemen?

A. Yes. I've worked with both individuals on occasion.

Q. Do you recall receiving a copy of this memorandum?

A. I don't remember this particular memorandum. I was on the distribution list here. I don't remember reading it.

Q. Could you take a look at it and read it and then tell me if you recall receiving it? Do you recall receiving a copy of this

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memorandum?

A. Well, I don't recall receiving the memorandum. I believe I must have, since I was on the distribution list, and I do recollect some of the work that's described here.

Q. What project or work is this memorandum relating to?

A. I believe it is related to products designed to have reduced sidestream yields.

Q. Why were you copied on this memorandum?

A. I don't remember why I was copied on this memorandum. It may have been because I was doing some work in the sidestream area. It may have been because I was working in the brands area at the time and I don't recall the scope of my activities during that May time frame in 1986.

Q. In this document it states initial work to determine the transfer efficiency of nicotine from cellulose acetate filters to mainstream smoke that demonstrated a 23 percent level for nicotine free base with negligible transfer of nicotine malate under the same conditions. Do you know what that means?

A. Yes. Apparently someone was adding

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nicotine to cellulose acetate filters to see if the added nicotine would transfer the smoke and they added it as the base as well as the malate salt and compared the transfer efficiencies from those two treated filters.

Q. Did this work ever end up in a commercially sold cigarette, to your knowledge?

A. I do not believe it ever ended up in a commercially sold cigarette, no.

Q. Are the people listed on the bottom of this sheet still employed at Reynolds, other than you?

A. Dr. Perfetti is. Mr. Defour is. Mr. Harden is not. Dr. Dube is.

Q. Did you work with all of these people?

A. Yes. I've worked with each of those people on occasion.

(PLAINTIFF'S EXHIBIT NUMBER 12 WAS MARKED FOR IDENTIFICATION)

BY MR. MAISTROS:

Q. Exhibit 12 is a memorandum from Mr. Dube to Mr. Lloyd, dated February 6, 1991. You are reflected as being copied on the document. Do you recall receiving a copy of this

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document and having had the opportunity to look at it?

A. I don't recall receiving this particular document on this particular day. I do recall getting the project XB weekly highlights during that time period. What I mean to say is, I don't recall this particular one.

Q. And project XB was what?

A. This was the project where we were attempting to develop a product with a reduced tar to nicotine ratio.

Q. Towards the bottom it says, under toxicology, question was raised concerning TSNA levels in a concentrated KDN extract. What is TSNA level?

A. I believe that TSNA refers to tobacco specific nitrosamines.

Q. What use did Reynolds make of levulinic acid?

A. Well, I think that with respect to this project, we used levulinic acid as an additive to the tobacco to help smooth the flavor of the smoke.

Q. Has Reynolds used levulinic acid in its commercially sold cigarettes?

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A. I don't know whether we have or not. I know there was some work done towards developing a flavor system that included levulinic acid. I don't know whether that was commercially used or not.

Q. The next page says, KDN extraction recovery system, J.S. Thommason. Who is J.S. Thommason?

A. That's Sam Thommason, he's an engineer at the time who was working in the product development or product technology development area.

Q. Now what is 605-11 referred to in that paragraph?

A. It is a plant location. I don't know which building that is.

Q. The sentence says first draft of a prefunding A/R has been written to begin work to begin installation of KDN extract recovery system at 605-11. Do you know if that was done?

A. I do not know if it was done.

Q. KDN extract storage at 605-12. Do you know if that was done?

A. I do not know if that was done.

Q. KDN extract application to sheet at

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603-1, do you know if that was done?
A. I do not know if that was done.
Q. What is 603-1?
A. It is another building. I don't know where that building is.
Q. Isn't that where they make the reconstituted tobacco?
A. Again, I don't know what that building code refers to.
Q. What was your role in the XB project?
A. I didn't have a role in the XB project. I worked for, at the time, R. A. Lloyd, the person to whom this memo is addressed, and I was aware of some of the work they were doing because I worked for Bob Lloyd, and the person in charge of XB also worked for Bob Lloyd, so we may have exchanged weekly highlight reports for a period of time.
Q. Did you work on the controversy involving the Barclay cigarette?
A. Yes, I did.
Q. What did you do?
A. I worked on a research study of how the Barclay cigarette performed relative to other cigarettes of similar tar yield.

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Q. For what purpose?
A. We were gathering evidence for a complaint that we registered with the FTC about the competitor that produced Barclay cigarettes.
Q. What was your complaint premised on?
A. That the Barclay cigarette could not be smoked without compromising the filter ventilation system.
Q. In what manner?
A. The design of the Barclay filter was such that there were channels formed in the periphery of the filter that were in flow communication with the vent holes in the tipping and in such a way that the only way ventilation air could enter the cigarette is through the vent holes in the tipping and then through the channels in the filter.
We believed that when smokers puffed on the Barclay cigarettes, their lips somehow covered the channels at the end of the filter, blocking the vent flow, ventilation air flow, and a consequence of that is when smokers use the cigarette normally they can't help but block the path for ventilation air, the yield would go up more than people who were smoking cigarettes of

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normal design.

Q. Were you involved in any other similar type work relating to any other cigarettes?

A. I've not been involved in any other incidents where we registered a complaint against a competitor.

Q. Have you been involved in work where you've analyzed competitors' cigarettes to try to determine what they are made of, how they are made?

A. Yes, I have.

Q. What work have you done in that area?

A. I have referred a couple of times in my testimony in the last day or two, about a recent project I've been involved in where we're trying to improve the flavor of our light products, and in that project, we've closely examined a competitor's product to see what they are doing.

Q. Which product?

A. Marlboro Lights.

Q. Have you figured out what they are doing?

A. Not completely, no. I mean, I don't think you could ever know from reverse engineering.

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Q. Have you looked at any past studies to determine if Reynolds attempted to figure out why Marlboros were so successful?

A. I'm aware of several exercises within R and D in the past where we've attempted to reverse engineer Marlboros.

Q. Are you aware of studies where Reynolds scientist determined that Marlboro or Phillip Morris' use of ammonia had something to do with the success of Marlboro?

A. I believe that in the reverse engineering exercises we have seen some level of evidence that made people believe that Phillip Morris uses ammonia in the way that's different from how we've employed it and that difference may be the way that they employ ammonia in the process and/or the particular tobaccos that they treat with ammonia.

Q. Does Reynolds use ammonia or diammonium phosphate in its unprocessed tobacco?

A. I'm not aware of a use of diammonium phosphate in unprocessed tobacco. As I've said before, we have used ammonia in a de-nicing process for burley. Our purpose was not to leave ammonia in that tobacco, in that case we were

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using the ammonia to remove some nicotine, and we have manufactured an ammoniated flue-cured product in the past.

Q. What is that called?

A. I'm not certain what the designation for that was.

Q. Now, is that a flue-cured unprocessed tobacco that is ammoniated?

A. I believe so, yes.

Q. Is there any other blends in those cigarettes that were marketed?

A. Yes. We had in the case of cigarettes with ammoniated flue-cured, it would have had burley tobacco in there, Turkish tobacco, G7 expanded tobacco.

Q. What years was the ammoniated flue-cured tobacco product marketed?

A. I'm not certain what the years were.

Q. What was the purpose of ammoniating the flue-cured tobacco?

A. Again, it was a flavor improvement.

Q. And nothing to do with nicotine or nicotine transfer efficiencies?

A. Not to my knowledge.

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(PLAINTIFF'S EXHIBIT NUMBER 13 WAS MARKED FOR IDENTIFICATION)

BY MR. MAISTROS:

Q. Exhibit 13 is a handwritten document with RJR stamp 12374 at the top. Do you recognize this handwriting?

A. No. I don't recognize this handwriting.

Q. Do you recognize on the first page any of the individuals that are listed next to the specific undertakings for 1979, such as Fredrickson, Perfetti?

A. Yes, I do.

Q. Who are those people?

A. Fredrickson, that's Jim Fredrickson.

Q. What group was he in?

A. This is 1979, I don't know what group he was in. He was a chemist or chemical engineer. I'm not clear on what his background was professionally, but he worked in the research department when I started to work at Reynolds.

Q. Was he in research when you were in research?

A. Yes, he was.

Q. And he was in research in 1979?

A. Well, again, I don't know where he was

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located in 1979. And then of course Perfetti, I believe that refers to Tom Perfetti, and Hayes is probably Lawrence Hayes.

Q. In the next page it says project 1250 smoke formation and nicotine control. Do you know what that project was?

A. I have some recollection of a project related to smoke formation.

Q. And nicotine control?

A. And nicotine control part is what I don't remember.

Q. As you read down below, does that refresh your recollection at all as to what this project was, acquisition of basic information about factors which effect smoke generating process, more specifically the collection of information which will identify the factors influencing nicotine delivery, characterize the mechanism of nicotine transfer and define the influence of water heat absorption and additives on the transfer of nicotine and other volatiles to mainstream smoke.

Does that refresh your recollection at all as to what this project was?

A. That appears to be a description that goes

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with this designation of smoke formation and nicotine control.

Q. Three pages in, the bottom it says RJR 12377.

A. Yes.

Q. It is listing specific undertakings for 1979. Number three says, determine nicotine transfer efficiencies and nicotine release profiles for various tobaccos such as flue-cured, burley, G7, KDN, tobaccos with varied levels of nicotine, treated tobaccos, nicotine salt and combination thereof. Were you aware that that work was going on in '79?

A. I'm aware of work in the past that was aimed at determining yield of nicotine from cigarettes made from one type of tobacco. I don't recall whether it was going on in 1979. Apparently this was a proposal that suggested doing the work in 1979.

Q. And these chemists were in the research department?

A. Yes. I believe everyone that I see listed on this front page, the names that I'm familiar with, were chemists or technicians in the research department.

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Q. If you look at the top it has number 12382. It says project 1250 smoke formation and tar/nicotine control.

A. Yes.

Q. And the next paragraph says in recent years air dilution has become the principal technique for reducing tar and nicotine deliveries. Do you agree with that statement?

A. I don't believe that air dilution is the principal technique for reducing tar and nicotine deliveries. I think air dilution is part of the system that includes the filter and some other details.

Q. However, it was found that a cigarette configuration which simply reduced tar and nicotine would not necessarily produce an acceptable low tar cigarette. Methods of controlling nicotine delivery were needed to adjust tar and nicotine ratios. Do you agree with that last statement?

A. I don't agree with it to the extent that any method of controlling nicotine delivery, apart from the methods that we used for tar yield control were applied in any commercial sense in this time frame, and I think what the writer may

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be suggesting here is that some new methods of control might be warranted for research purposes.

Q. That's what you are guessing?

A. That's what I am guessing.

Q. And the next paragraph says, in 1978 a long range, 3 - 5 years, investigation was begun to search for fundamental information on the various factors which effect nicotine delivery. Is that a true statement?

A. I don't have any reason to argue with it. I don't know the specifics of a long range investigation.

Q. The author goes on to describe the initial work consisted of investigation of: One, the distribution of nicotine and how it was bound in tobacco. Two, the properties of various nicotine salt that elevated temperatures. Three, the release of nicotine from -- something salt, and elevated temperatures and the accompanying thermal segregation. Four, other factors which effect nicotine transfer from tobacco. Five, the effects of heat treatments on selected additives on nicotine delivery. Six, the effect of redistribution of nicotine among tobacco types and grades on nicotine delivery. Most of these

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studies will be continued in 1979.

Were you aware that those studies were commenced in '78?

A. I'm aware of studies related to some of the things that are discussed here. I wasn't aware that they began in 1978.

Q. Were you aware that such studies began with respect to those six items on this list?

A. Again, I think I'm aware of studies related to each of the items on that list, the particular timing of when any studies of those were done, I'm not aware of.

Q. Go to the page that says 1288 at top. It is third from the end. I'm sorry, 12388 at the top. It says, the overall objective is to provide information about smoke formation which can be used in the design of products. The immediate short term goal is the acquisition of information about factors which effect nicotine transfer to mainstream smoke. The level of effort on the nicotine transfer efficiency is expected to remain at approximately the current level through 1980. Some efforts may be devoted to the investigation of ways to adjust nicotine

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transfer mainstream by altering conditions in the tobacco rod in 1980.

Subsequent investigations may include examination of the effect of change and processes occurring in the tobacco rod on the formation and/or delivery of other smoke constituents and the effect of heat absorption by tobacco conditions simulating the conditions in various leaf and manufacturing processes. Were you aware of those long range plans in 1979?

A. I don't recall those long range plans at all, much less 1979. What it looks like to me is this is, again, a suggested course of action for research activities.

Q. And you have no idea whose handwriting this is?

A. No. I can't recognize this handwriting.

Q. Who was in charge of the chemists in 1979?

A. Well, if it's true that in 1979 we still had the research department and, again, I can't recall whether we reorganized in 1979 or 1980, but under the old structure of the research department there was a chemical division that was headed by Don Field, and to the best of my

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recollection, he had two individuals reporting to him, one was Mary Stowe and the other was Don Henley, and all the groups involved in the chemical division, there were chemists working there, so I don't know which person could have written this.

(OFF THE RECORD)

BY MR. MAISTROS:

Q. Have you ever been a member of the Scientific Advisory Board?

A. No, I have not.

Q. Have you ever attended any Tobacco Institute meetings?

A. No, I have not.

Q. Have you ever attended any CTR meetings?

A. No, I have not.

Q. Have you ever been responsible for contracting with outside laboratories for research conducted on behalf of Reynolds?

A. On maybe one or two occasions I have, yes.

Q. And what occasions were those?

A. One that I can recall, was a project that we funded at Bethal in Columbus, Ohio, and the purpose of that was for Betel to research

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potential filter additives that we could use to reduce carbon monoxide yields.

Q. Any other occasions?

A. I can't recall another specific incident, but there may have been others.

Q. Do you know what work Reynolds has done to determine whether or not nicotine is carcinogenic?

A. I'm not aware of any work that Reynolds has done to determine carcinogenicity of nicotine.

Q. How about whether nicotine is a tumor promoter?

A. I'm not aware of any work that we've done on any potential of tumor promotion of nicotine.

Q. That would be true from '76 to the present?

A. Yes.

Q. Do you know what dopamine is?

A. I know that it's a chemical that's produced in the human body, and that's all I know about it.

Q. Do you know where it is produced?

A. No, I do not.

Q. Do you know what relationship it has if any to nicotine?

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A. No, I do not.

Q. How is Eclipse a response to medical and consumer complaints on smoking?

A. Well, in the Eclipse cigarette design, we've sought to reduce or eliminate a number of constituents that are in the mainstream smoke of what I would term traditional or more conventional cigarettes and to the extent that reduced yields of tar and constituents of tar represent reduced health risks, Eclipse is a response to health criticisms.

Q. Does Eclipse reduce the nicotine yield of cigarettes?

A. Well, the yield of Eclipse cigarettes, nicotine yield of Eclipse cigarettes is within the range of ultra low tar products, but it is reduced relative to the sales weighted average of the industry today.

Q. Do you know what the transfer efficiency of the tobacco in Eclipse is?

A. I do not, no.

Q. Do you know what the special projects committee is or was?

A. No, I don't.

Q. Do you know what project RAN was?

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A. I think that project RAN represented reduced Ames numbers is what those initials stood for, and what that project was about was finding ways to reduce the mutagenicity as measured by the Ames essay of cigarette smoke condensate.

Q. What specific documents did you rely upon in arriving at your conclusion that Reynolds responded and met the criticisms of the scientific and medical community?

A. I don't know that I relied on any specific document to arrive at that conclusion. I think my conclusion is based on the fact that R.J. Reynolds has produced cigarettes with reduced smoke constituent yields.

Q. Did you go back and look at the Reynolds research to determine when Reynolds first believed that certain smoke constituents may have presented a health problem?

A. I'm aware of some documents that report reviews of literature from the 1950's that discuss potential health risks of cigarettes.

Q. Those are Reynolds internal documents?

A. Reynolds internal documents that was available in the early 50's.

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Q. Did you look at the actual research memos and documents that were created by Reynolds with respect to research that Reynolds did on those issues?

A. I have looked at a few of those, yes.

Q. Which ones?

A. I don't recall exactly which ones.

Q. Have you looked at documents that would tell you when Reynolds first did research to determine if there was any link between cigarette smoking and cancer?

A. I'm not aware of internal research that Reynolds may have done to explore any link between cigarette smoking and cancer.

Q. How about external work Reynolds contracted for?

A. I haven't seen any reports on external work that Reynolds contracted for.

Q. Did you see any internal Reynolds work which established potential concerns related to benzopyrene?

A. Again, I've seen some literature surveys that were written by Reynolds personnel that discussed the potential risks associated with benzopyrene.

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Q. Do you know when Reynolds was first aware of that potential risks?

A. I believe that people in Reynolds were aware of that in the early 50's. That may not be the first time anyone was aware of it, but I believe they were aware by the 1950's, early 1950's.

Q. Do you know what year Reynolds first undertook its own research to determine if there was any association between benzopyrene and any alleged health risks?

A. I don't know whether Reynolds ever did any research internally on the relationship between benzopyrene and health risks. I know that Reynolds did research on means to reduce the yield of benzopyrene in smoke.

Q. Do you know when that was?

A. I believe those efforts began in the early 1950's.

Q. Did Reynolds commercially market any cigarettes that had the effect of reducing benzopyrene levels?

A. Yes, we have.

Q. Which cigarettes?

A. In my opinion, all cigarettes sold since

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the advent of fairly efficient cigarette filters have reduced the benzopyrene.

Q. Have any cigarettes been sold commercially by Reynolds that had the effect of selectively reducing the effects of benzopyrene?

A. I don't believe so. I believe the reduction we received in benzopyrene yield was as a consequence of reducing smoke yield in general by virtue of use of filters and porous cigarette paper in the early days and then later on with use of air dilution and expanded tobacco. In fact, as the tar yield decreases so does the benzopyrene yield?

Q. When did Reynolds first determine there was a cause for concern with respect to phenols?

A. I think the reason for concern about phenol was raised by scientists in the smoking health field outside of Reynolds, and I'm not certain when exactly that concern arose. It was probably in the light 50's or early 60's.

Q. Do you know what internal research Reynolds has conducted to determine if there is a reason to be concerned about phenols in cigarette smoke?

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A. No. I'm not certain of what research we've done internally with regard to phenols' effect on health.

Q. Do you know when nitrosamine first became an issue with respect to cigarette smoke?

A. I think that at least with regard to tobacco specific nitrosamines, the issue first was raised in the late 60's or early 70's.

Q. Do you know what work Reynolds did to research whether or not there was merit to the concerns related to nitrosamine?

A. I don't know of any work conducted internally at Reynolds that's related to any effect of nitrosamine on health. I know that we've done research on the tobacco specific nitrosamine contents of tobaccos, and we've done research to identify and quantify the yield of tobacco specific nitrosamines in smoke.

We have found that as the tar yield of cigarettes declines through the use of techniques that we used to control tar deliveries, so do the tobacco specific nitrosamines levels.

Q. Has Reynolds commercially sold any product that selectively reduced nitrosamine levels in tobacco smoke?

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A. Would you repeat your question, please?

Q. Has Reynolds commercially sold any products that have the effect of selectively reducing the nitrosamine levels in tobacco smoke?

A. I think that charcoal filtered cigarettes may have an effect of selective removal of the nitrosamines that are not tobacco specific. That being the case, the Tempo cigarette that we sold before probably had a selective reduction effect on nitrosamines, and although at the time it was being sold we may not have been able to measure those. The EW cigarette with its charcoal filter may have selectively reduced the non specific nitrosamines.

Q. EW has not been commercially sold, right?

A. It was commercially sold in a test market only.

Q. Do you know of any commercial products Reynolds has sold that had the purpose of selectively reducing the phenols?

A. Cellulose acetate filters treated with the plasticizer we routinely employ which is triacetin, selectively removes phenols from smoke.

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Q. With what efficiency?
A. I don't know the removal efficiency number off the top of my head. Typically, selective removal is expressed as a ratio of removal efficiency of the component of interest relative to the removal efficiency for tar, and the selective ratio for phenols can be from about two to three, so typical cellulose acetate filters are quite efficient for phenols.
Q. Two to three to what?
A. Well, the selective ratio that some people define is actually one minus the filter efficiency for phenol divided by one minus efficiency for tar, so that ratio would be two to three when calculated that way.
Q. Give me a ratio, if you could, of what is the total content of phenols in a typical cigarette smoke versus the amount that is filtered.
A. Again, I can't recall that number. I would have to go look that up.
Q. What other compound of concern has Reynolds attempted to selectively reduce or eliminate?
A. One is carbon monoxide.

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Q. What products have done that?
A. We have been unsuccessful in attempts to selectively reduce the carbon monoxide yield of cigarettes, however, when we employ air dilution, we reduce carbon monoxide yield in rough proportion to the tar.
Q. Any other compounds that Reynolds has attempted to selectively reduce?
A. Oxides of nitrogen.
Q. How have they attempted to do that?
A. We have done research on agents that we could put in filters that may reduce the yields of oxides of nitrogen, and those attempts have been unsuccessful.
Q. Has Reynolds commercially marketed any cigarettes that selectively reduce oxides of nitrogen?
A. I don't believe so.
Q. Any other compounds selectively reduced?
A. I can't recall any that we haven't discussed.
Q. What are ciliastats?
A. Cilia, refers to the cellular structures or hairy, they are little hairy structures that are

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in the upper airways in the respiratory track. Stasis refers to stopping the action of cilia. The function of cilia is to clear and keep the mucus in the upper airways moving. Some ciliastasis is the act of stopping the function of the cilia. Ciliastats would be some agent that stops the action of cilia.

Q. Are there any ciliastats in tobacco smoke?

A. Some researchers believe that portions of vapor phase can be ciliastatic.

Q. Some researchers. Any of those researchers at Reynolds?

A. I don't know who at Reynolds might believe that, no.

Q. Do you believe that?

A. I don't know. I'm not a health researcher.

MR. MAISTROS: Okay. Thank you, very much. You have the right to review this before you sign it, counsel I'm sure will explains that to you.

MR. BELASIC: Just for the record, we will review it, sign it, prepare an errata sheet if there are any corrections.

(DEPOSITION CONCLUDED AT 2:58 P.M.)

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C E R T F I C A T E

I, Alan Norman, do hereby certify that I have read and understand the foregoing transcript and believe it to be a true, accurate, and complete transcript of my testimony, subject to the attached list of changes, if any.

Alan Norman

This deposition was signed in my presence by Alan Norman on the _____ day of _____, 1997.

_____

Notary Public

My Commission Expires:

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State of North Carolina
County of Forsyth

REPORTER'S CERTIFICATE

I, Jane F. Allen, a Notary Public in and for the State of North Carolina, do hereby certify that there came before me on Wednesday, November 19, 1997, the person hereinbefore named, who was by me duly sworn to testify to the truth and nothing but the truth of his knowledge concerning the matters in controversy in this cause; that the witness was thereupon examined under oath, the examination reduced to typewriting under my direction, and the deposition is a true record of the testimony given by the witness.

I further certify that I am neither attorney or counsel for, nor related to or employed by, any attorney or counsel employed by the parties hereto or financially interested in the action.

IN WITNESS WHEREOF, I have hereto set my hand and affixed my official notarial seal, this the 24th day of November 1997.

Jane F. Allen, Notary Public
My Commission Expires 10/26/02

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